

Communication.

THE ANALYSIS OF BENZOL FIRST-RUNNINGS.

BY PERCY E. SPIELMANN, PH.D., B.SC., F.I.C., AND
F. BUTLER JONES, B.A.(CANTAB.).

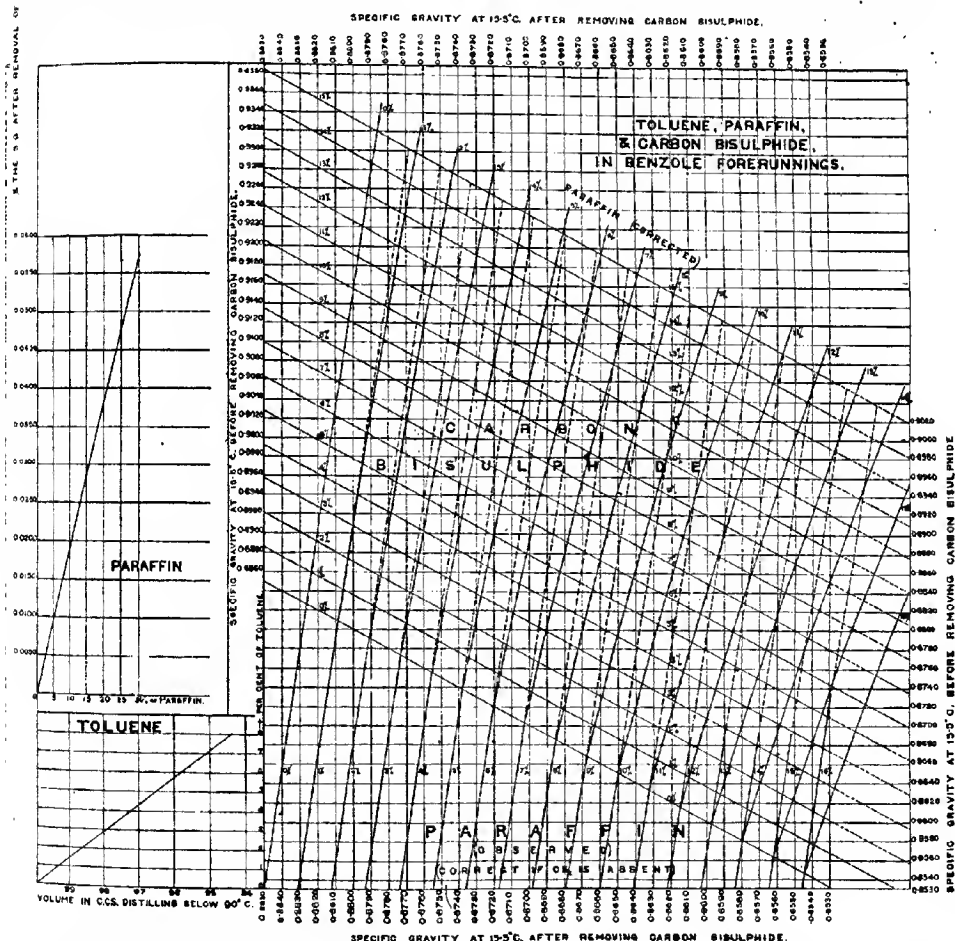
Experiments have been carried out in order to ascertain whether the method for the analysis of commercial benzols (this Journal, April 15th, 1916, p. 396) is applicable to first-runings.

(5%) within the limits of accuracy of the earlier benzol analysis.

It was found, further, that water-soluble substances were insufficient in quantity to affect estimation by specific gravity, and also that a severe washing with sulphuric acid to remove other impurities did not cause alteration.

The method previously described can therefore be applied directly to the evaluation of benzol first-runings with the following modifications:—

1. *Carbon bisulphide*.—The estimation of a high percentage of carbon bisulphide is most conveniently carried out by diluting the sample with



This fraction differs from the benzol fraction mainly in containing up to 10% or 15% (and rarely as much as 65%) of carbon bisulphide, and up to 15% paraffin, together with very small proportions of a number of other substances.

From a known mixture it was found that even 65% of carbon bisulphide gave a distillation test corresponding to the amount of toluene added

up to five times its volume of benzene, which has been previously purified from any carbon bisulphide that it may contain.

2. *Paraffin*.—The specific gravity of the paraffin of this fraction is 0.700.

If the percentage of paraffin is such that it lies outside the graph, its quantity can be determined most easily by employing the simpler of

the two benzol graphs (*loc. cit.*), ascertaining the specific gravity of the benzene-toluene mixture by its means, and determining the difference between this and that of the sample under examination after removal of CS_2 ; the resulting difference is then evaluated by means of the paraffin graph in the present paper.

Further, it becomes necessary to take into consideration the percentage of carbon bisulphide present and to correct the quantity of paraffin found by differences of gravities.

If, for instance, 10% of carbon bisulphide is present, the quantity of paraffin found will be that present in 90 c.c. of liquid and the value, therefore, will have to be diminished in the ratio of 90 : 100.

In general, paraffin (true figure) = paraffin found multiplied by the fraction $\frac{100-x}{100}$, where x is the percentage of CS_2 .

This correction need not actually be calculated as it can be obtained directly in the accompanying graph (p. 911).

The following examples of known mixtures indicate the mode of employment:—

(1) Mixture taken : 4% toluene, 3% paraffin, 12% CS_2 , 81% benzene.

Distillation of 100 c.c. up to 90° C. gives 97.5 c.c., equivalent to 3.6% toluene.

Specific gravity after removal of CS_2 : 0.8762.

Junction of 3.6% toluene with gravity 0.8762 line is at 4.3% paraffin.

Specific gravity of original sample : 0.9205.

Specific gravity after removal of CS_2 : 0.8762 = 12.5% CS_2 .

In order to obtain a correct value for the paraffin, the point representing the observed percentage is moved upwards continuously, equidistant from the continuous and then discontinuous straight lines, until it reaches the point representing the carbon bisulphide percentage; this point gives the correct value of 3.8% paraffin.

(2) The mixture taken consisted of:—4% toluene, 11% paraffin, 50% carbon bisulphide, 35% benzene.

Distillation of 100 c.c. to 90° C. yields 97.1 c.c. = 4% toluene.

As the mixture has a gravity of 1.0496, which is outside the graph, exactly 15 c.c. was diluted five times, i.e., to 75 c.c., with pure benzene. The specific gravity of this mixture 0.9150, the specific gravity after removal of CS_2 : 0.8794 = 10% CS_2 = (5 × 10 =) 50% on the original.

The junction of 4% toluene and the 0.8794 line is at 2.6% paraffin; this figure corrected as before shows 2.3% paraffin, which equals (5 × 2.3 =) 11.5% on the original.

It will be realised that for high percentages of carbon bisulphide and paraffin the results will be less accurate than those obtained in the analysis of benzols, but at the same time, that there are no serious deviations from the true values.

previous Government action in connection with research during the present century, deals at some length with the White Paper issued by the President of the Board of Education [Cd. 8005] describing the Government Scheme for organising and developing research. Early in its deliberations the Committee decided to give science in its applications to industry preference over pure science, realising that the "practical business world" had to be dealt with. This course was also desirable in view of the fact that the Universities have been so depleted of students and teachers that they have neither the leisure nor the detachment of spirit essential to original research. The Committee therefore determined to pursue a system of careful inquiry and consultation. The first inquiries showed that there were certain researches being conducted or directed by professional associations in the period preceding the war which stood in grave jeopardy of enforced abandonment; in order to secure the continuance of as many of these researches as possible, it was decided to recommend the payment of suitable grants to the societies concerned (a list of these is given in Appendix III.). The Chairman and other officers of the Committee have interviewed representatives of a large number of the principal scientific and technical societies, "in all cases with gratifying results." It is noted that the most highly organised industries are generally those which have made the most use of research and are consequently more ready for, though possibly not most in need of, the encouragement it is the duty of the Committee to afford. It is stated that "the chemical trades for the most part are so divided and individual in outlook that the various professional societies have had neither the influence nor the means necessary to enable them to take a large share in promoting research in connection with those industries." In the meantime the Universities and Technical Colleges of the country had been invited to form a register of researches actually in progress at the outbreak of war, and a survey is now being made of the amount and the character of the provision made in our higher educational institutions for research work. The possibility of inducing firms in some of our industries to inform the Committee, in confidence, of problems in hand or in contemplation, is also being considered. In the latter connection mention is made of the spirit of co-operation which is growing up in many of the industries. The Committee has caused inquiries to be made in the Universities and Technical Colleges as to the existence of students or teachers not engaged on war duties who might be retained for scientific research if the Committee would assist them. As a result the Committee has recommended grants to some 40 individuals, amounting in all to about £6000. It is also hoped to give assistance in correlating the researches being made into the same problem by encouraging the interchange of information. Something in this direction has already been achieved, as in the cases of the researches of steam nozzles and optical glass.

At an early date the Committee became convinced that it would be necessary to form a series of strong Standing Committees to assist them in surveying fields of research, in constructing panels of referees, and in dealing with applications for grants. Three such Committees have now been set up, namely a Committee on Metallurgy under the chairmanship of Sir Gerard Muntz, with special sections for ferrous and non-ferrous metallurgy; a Committee on Engineering under the chairmanship of Sir Maurice Fitzmaurice; and a Committee on Mining under the chairmanship of Sir William Garforth, with a section on the mining of iron, coal, and hydrocarbons, and a section

REPORT OF THE COMMITTEE OF THE PRIVY COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH FOR THE YEAR 1915-1916. [Cn. 8336.]

The Committee constituted by Order in Council dated July 28th, 1915 (see this Journal, 1915, 783), has issued its first report, which, after noting

on the mining of other minerals. The formation of other Committees is in contemplation, probably including Committees on fuel, rubber, cotton and paper, textiles, etc.

Reference is made to the work of the Glass Research Committee of the Institute of Chemistry, and of the efforts made in Staffordshire to produce Seger cones and laboratory porcelain, etc. A grant has been recommended for the erection and maintenance of research laboratories and workshops in connection with the Stoke Pottery School.

Referring to the movement towards trade association, the report states that it is evident that the difficulties of tradition, trade organisation, and national temperament which stand in the way of combination, must be squarely faced if progress is to be made and must be dealt with as part of a comprehensive plan. The Committee expects to have in growing measure the help and sympathy of manufacturers in the work that lies ahead, and note is made of the willingness which has been shown by certain manufacturers to support researches undertaken in the interests of their industries.

One of the chief impediments in the way of organisation of research is thought to be the small scale on which most British industrial firms have been planned. It may be desirable for the State to take special pains to encourage those scientific industries which are recognised as being essential to the national well-being, and accordingly the State may be well advised to support researches in these industries to a greater degree than in ordinary cases. Among the industries mentioned in this connection are the manufacture of optical and chemical glass, porcelain, fine chemicals, dyestuffs, synthetic drugs, and high explosives. Further, if a healthy condition of inquiry is to be fostered in these industries, the Committee recognises the need for convincing the manufacturing world in general that scientific research is a paying proposition. The shortest means to this end is believed to be an attack upon the pressing problems of manufacture which arise in the course of the ordinary routine. The Committee declares that unless the generality of British firms can be induced to alter their present attitude, it will have failed profoundly in one of its appointed tasks.

It is recognised that the Universities must be the main sources of research in pure science, but that they can also with their existing organisation assist smaller firms and less important industries to solve the problems immediately in front of them, and also attack certain fundamental problems of research in applied science. The present organisation of some of the special technological departments of the Universities and technical schools may need modification if they are successfully to carry the burden that will be put upon them in the future. In the new laboratories at Stoke and the proposed Research Institute for Glass at Sheffield University, the departments are to be conducted by special Committees or delegacies consisting of representatives of the parent body and of the industries concerned.

The question of organisation of research in the whole British Empire is also engaging the attention of the Committee, and memoranda on the subject have been received from several of the Colonial Governments. It is probable that one of the first preliminaries to joint research will be the making of a systematic survey of the mineral and other resources of the Empire.

The two principal conditions which must be secured if the objects for which the Committee were established are to be attained, are first, a

largely increased supply of competent researchers, and secondly a hearty spirit of co-operation among all concerned—men of science, men of business, working men, professional and scientific societies, Universities and Technical Colleges, Local Authorities and Government Departments. The first condition can only be fulfilled if a larger number of well-educated students can be induced to enter the Universities; that is the problem which the Education Departments have to solve. As regards the second condition, progress in co-operative effort is undoubtedly being made in many directions, but there are specially strong reasons for more co-operation between the various firms in each industry and between the industries and the State in the furtherance of research. Fundamental research demands a very large expenditure of brains and equipment, and also requires continuous effort. If the general level of manufacture can be rapidly raised by co-operative effort in the exchange of information between firms, and in the support of national trade institutes for research, as well as in the improvement of the conditions and efficiency of labour, this country will have gone far towards establishing its industrial prosperity on a firm basis.

GOVERNMENT COMMITTEE ON SCIENCE.

IN pursuance of the arrangements which the Government have made for reviewing the system of education as a whole, the Prime Minister has appointed a Committee to inquire into the position occupied by Natural Science in the educational system of Great Britain, especially in secondary schools and universities; and to advise what measures are needed to promote its study, regard being had to the requirements of a liberal education, to the advancement of pure science, and to the interests of the trades, industries, and professions which particularly depend upon Applied Science. The Committee consists of: Sir J. J. Thomson, O.M., D.Sc. (Chairman), the Rt. Hon. F. D. Acland, M.P., Professor H. B. Baker, D.Sc., F.R.S., Mr. Graham Balfour, Sir William Beardmore, Bt., Sir G. H. Cloughton, Bt., Mr. C. W. Crook, Miss E. R. Gwatkin, Sir Henry Hibbert, M.P., Mr. William Neagle, Mr. F. G. Ogilvie, C.B., Dr. Michael Sadler, C.B., Professor E. H. Starling, M.D., F.R.S., Mr. W. W. Vaughan, Secretary: Mr. F. B. Stead, H.M. Inspector of Schools.

Obituary.

ARTHUR FRANK HESS.

A. F. Hess was born in 1884 at Leeds. He was educated at Harrogate, Rugby, and Oxford, and was subsequently engaged at various oil and stearine works, tar distilleries, and by-product coke oven works. In 1906 he joined the firm of Adolph Hess and Brother, Ltd., oil distillers and refiners, of Leeds and Hull, and in 1912 became a director. For many years he had been attached to the Leeds Volunteers and Territorials, and soon after the outbreak of war acted as Adjutant to General Baldock, having attained the rank of Captain. Later he joined the West Yorkshire Regiment and was promoted to the rank of Major. He was wounded in August, 1915, and again on July 1st last, and died of his wounds on July 14th.

Journal and Patent Literature.

PATENT SPECIFICATIONS may be obtained by post by remitting as follows:—

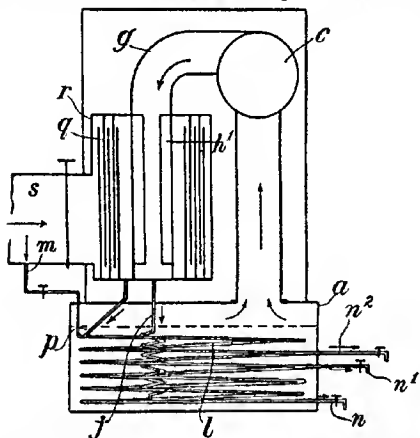
English.—£d. each, to the Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.
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French.—1 fr. 05 c. each, as follows: Patents dated 1902 to 1907 inclusive, Belin et Cie., 56 Rue Ferou 8, Paris (Se.); Patents from 1908 to date, L'Imprimerie Nationale, 87, Rue Vieille du Temple, Paris.

I.—GENERAL; PLANT; MACHINERY.

PATENTS.

Cooling liquids and gases; Method of and means for — G. James, London. Eng. Pat. 6275, Apr. 27, 1915.

LIQUID, *e.g.*, liquid air, is contained in the tank, *a*, and is evaporated under reduced pressure produced by the fan, *c*. The saturated vapour is delivered



into the conduit, *g*, under increased pressure which causes condensation and return of the liquid by the coil, *j*, to the tank in a closed cycle, thus maintaining a reduced temperature in the tank. A coil, *l*, immersed in the liquid, has one end, *m*, open to the air so that air enters and is continuously liquefied. Cold air may thus be drawn off by the pipe, *n^2*, colder air by the pipe, *n^1*, and liquid air by the pipe, *n*. Radial and cylindrical plates, *M*, *g*, may be provided in the casing, *r*, so that air entering by the conduit, *s*, passes between these plates to the tube, *p*, and coil, *l*.—W. F. F.

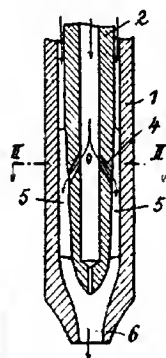
Regulating and measuring the proportional flow of liquids or liquids and gases; Method of and means for — J. E. Lea, Manchester. Eng. Pat. 9067, June 21, 1915.

THE liquid, the flow of which is to regulate that of the other, passes through a tank provided with a V-notch or a weir, and with a float which operates a rotary or wedge-shaped cam. The second liquid, the flow of which is to be regulated, passes through a pipe fitted with a valve, to which is applied a lever which is acted upon at its free end by the cam. The contour of the cam embodies the formulae of the "rates of flow" of the one liquid over the V-notch and the other liquid through the pipe controlled by the valve. As the float rises and falls with the variation in the flow of the first liquid, so the cam opens or closes proportionately the valve through which the second liquid passes. In the case of a gas and a liquid, the apparatus is the same, the gas passing through the pipe with the valve, and being delivered into the tank holding the regulating liquid.—J.H.J.

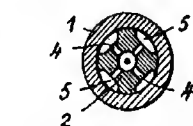
Extracting and discharging condensate and air from a condenser; Method of and apparatus for — Ges. für Kälteindustrie m. b. H., Berlin. Eng. Pat. 9724, July 3, 1915. Under Int. Conv., July 4, 1914.

AN ejector of the water filter-pump type is used to extract the air and condensed water from a condenser. The supply of water to operate the ejector is distinct from the cooling water supply, and is circulated by a rotary pump on the pressure side of which the ejector is fixed.—W. H. C.

Atomisation of liquids, and in particular of liquids having a considerable viscosity. A. V. Lipinski, Zürich, Switzerland. Eng. Pat. 10,040, July 9, 1915. Under Int. Conv., July 9, 1914.



THE apparatus consists of an outer cylindrical casing, 1, and an inner tube, 2, of polygonal shape, which forms a number of chambers, 5, into which the oil



or other liquid to be atomised is fed. The gaseous atomising medium is delivered into the inner tube, 2, and a portion of it passes through the inclined orifices, 4, into the passages, 5, and spreads the liquid as a film, and prevents the formation of drops. The rest of the atomising medium passes from the end of the inner tube and sprays the liquid through the nozzle orifices, 6. The cross-sectional area of the passages, 5, either increases or remains constant from the inlet to the discharge end.—W. H. C.

Filters. W. S. Thompson, Dundee. Eng. Pat. 15,110, Oct. 26, 1915.

CYLINDRICAL filter elements are supported so that they can be rotated on one or more shafts which pass through, and project for a considerable distance beyond one end of, the filter chamber. When it is necessary to clean or renew the filtering medium, the end of the outer chamber is removed and the filter elements are moved along the shafts out of the chamber.—W. H. C.

Filter for liquids containing suspended organic matter; Drum — M. Hosch, Berlin-Halensee. Ger. Pat. 292,754, June 23, 1914.

THE filter-drum rotates in a trough containing the liquid to be filtered, and a surging motion is imparted to the liquid by the introduction of compressed air or by other means. The compressed air is preferably introduced below the drum and in a direction approximately tangential to the ascending part of the drum. The separated solids are removed from the surface of the drum by a roller and scraper. The outlets for the solids and for the filtered liquid are adjustable, so that

they can be arranged at different levels according to the direction of rotation of the drum. The surging motion of the liquid prevents clogging of the filtering surface.—A. S.

Air filters. G. A. Mower, and Sturtevant Engineering Co., Ltd., London. Eng. Pat. 100,876, Mar. 18, 1916. (Appl. No. 4063 of 1916.)

In an air filter of the type in which the dust is collected in suspended filter bags which are periodically shaken, a valve-operating rod is moved periodically to open the filtering chamber to suction during the filtering period, and to the atmosphere during the shaking period. The shaking device is also operated in proper sequence by the same rod. Two or more groups of filter bags may be combined so that one group is being shaken while the other is in use.—W. F. F.

Evaporating liquids; Apparatus for— A. Rodlich, Vienna. Eng. Pat. 100,250, Mar. 28, 1916. Under Int. Conv., Apr. 6, 1915. (Appl. No. 4555 of 1916.)

A NUMBER of hollow horizontal discs, separated by distance-pieces, are carried by a rotating hollow central shaft and contained in a cylindrical casing. Steam is supplied through the shaft to the interior of the discs, and the condensed water passes upwards, through short pipes connecting the discs at their peripheries, to an annular gutter at the top of the casing from which it is discharged. Liquid to be evaporated passes from a pocket on the outer wall of the casing and is projected through nozzles between the discs towards the centre, afterwards travelling outwards over the discs by centrifugal force. Several units may be combined to form a multiple-effect apparatus.—W. F. F.

Furnace-setting for concentration pots. F. H. Nickle, Midland, Mich. U.S. Pat. 1,191,338, July 18, 1916. Date of appl., Dec. 18, 1915.

THE liquor to be concentrated is contained in pots of circular horizontal cross-section, each being surrounded by a concentric casing. The casing is enlarged at one point to form a combustion chamber, which is bounded on one side by a radial wall in contact with the pot, so that the hot gases are made to travel horizontally round the pot, thus causing a circulation of the liquid in the same direction.—W. F. F.

Evaporating pans; Cover for— L. N. Moody, Plover, Iowa, Assignor to A. M. Tower, Barton, Vt. U.S. Pat. 1,191,982, July 25, 1916. Date of appl., Mar. 5, 1915.

A COVER for evaporating pans comprises a cylindrical casing with a closed top and an inner partition composed of overlapping, slightly separated plates, rising from the opposite side walls towards the centre, and the lowest plate on each side forming a gutter by contact with the side wall. Another gutter is formed on the walls just below the first gutter, and both are provided with drain pipes to carry off the condensed liquid.—W. F. F.

Ball grinding machines. Deutsche Waffen- und Munitionsfabriken, Berlin. Eng. Pat. 100,319, Apr. 20, 1916. Under Int. Conv., Feb. 3, 1915. (Appl. No. 5852 of 1910.) Addition to Eng. Pat. 10,688 of 1914.

To effect a better distribution, the balls are collected towards the centre by funnel-shaped plates and delivered from the apex to the ridge of the roof-shaped bottom of the feed chamber. The gathering of the balls to the centre is also assisted by providing in the feed space two oppositely rotating winged shafts.—W. H. C.

Ball-mills [for grinding bacteria and bacterial products]. J. P. McGowan, Edinburgh. Eng. Pat. 100,719, Mar. 11, 1916. (Appl. No. 3644 of 1916.)

A GLASS or porcelain mill with glass or porcelain balls is used for grinding bacteria. The entrance to the mill is placed on the rim, and the size of the balls is varied according to the nature of the material to be ground. The interior surface has only rounded curves, so that the partially ground material cannot collect away from the grinding action of the balls. When charged the mill is fixed to a rotating disc, and when the operation of grinding is over, the mill is removed for emptying and cleaning.—W. H. C.

Grinding-machine. F. N. and F. E. Gardner, Assignors to L. W. Thompson, Beloit, Wis. U.S. Pat. 1,189,557, July 4, 1916. Date of appl., Nov. 23, 1912.

A NORMALLY vertical grinding cylinder is rotated within a casing, and a rack and pinion mechanism, which can be operated by hand, is provided to tilt the cylinder.—W. H. C.

Drying materials in sacks and the like; Method of and apparatus for— H. P. Dinesen, Herlov, Denmark. Eng. Pat. 100,697, Jan. 10, 1916. (Appl. No. 411 of 1916.)

THE sacks or other flexible receptacles are placed separately over apertures in a conduit so that each forms, by its own weight, a sufficiently tight joint. A lowering of pressure produced in the conduit causes air to pass through the sacks and the material therein, thus drying the material. If necessary the air may be heated.—W. H. C.

Dryers. C. A. Wendell, Joliet, Ill. U.S. Pat. (A) 1,187,584 and (B) 1,187,585, June 20, 1916. Date of appl., June 12, 1915.

(A) A CENTRIFUGAL dryer consists of a dish-shaped screen and a shoot which are inclined upwards and outwards at different angles and are rotated at the same speed about a common axis. The material is fed into the screen, and a scraper is provided which travels over the surface of the screen and across the shoot substantially at right angles to the line of travel of the material across the screen. The scraper is rotated at a different speed from that of the screen and shoot. (B) The material is fed into the dryer from a supply device which is rotated in the same direction, but at a different rate from the dryer. The drying compartment has a series of separately mounted screen sections, which are either tilted, or rotated at a different speed, to discharge the dried material. The liquid is received into a receptacle which is always in position outside the screen sections, and the solids are received in a receptacle which is in communication with the interior of the section at the time of discharge only.—W. H. C.

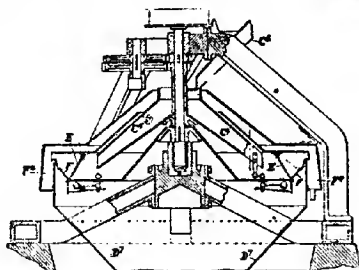
Drying apparatus. W. Bartholomew, Assignor to Troy Laundry Machinery Co., Ltd., Chicago, Ill. U.S. Pat. 1,189,777, July 4, 1916. Date of appl., Aug. 28, 1914.

THE articles being dried are contained in a rotary cylinder within an outer casing which also encloses heating coils, a rotary cleaning screen, a rotary brush for cleaning the latter, and a fan. Air passes from the cylinder through the screen to the fan and thence over the heating coils back to the cylinder.—W. H. C.

Dryer. C. A. Wendell, Joliet, Ill. U.S. Pat. 1,190,829, July 11, 1916. Date of appl., June 12, 1915. Renewed, May 19, 1916.

In a centrifugal dryer, a feed shoot, C⁵C⁴, delivers the material to the inner side of an inclined screen,

B, constructed in sections, each provided with a deflecting plate, F, to direct the liquid passing



through the screen into an outer receptacle, F⁴. Means are provided for swinging the screen sections (together with the deflecting plates) to permit the dried material to escape into a second receptacle, D⁷.—J. H. L.

Drying-cylinder. A. H. White, Brooklyn, N.Y. U.S. Pat. 1,189,761, July 4, 1916. Date of appl., Oct. 22, 1914.

STEAM is passed through the fixed pipe, 22, 15, 16, into the interior of the rotary drying cylinder, the perforated portion of the pipe, 16, being



always submerged in the condensed water, which collects in the cylinder. The water is thus maintained at a high temperature, and serves to transmit heat from the steam to the surface of the cylinder. A pipe, 19, is provided to remove excess water of condensation.—W. H. C.

Drying mechanism. W. R. Macklind, Assignor to G. A. Martin, Cleveland, Ohio. U.S. Pat. 1,191,921, July 18, 1916. Date of appl., Aug. 10, 1912.

A HORIZONTAL, annular drying table is provided with a fixed central column on which is mounted a removable sleeve carrying a rotatable frame with radial arms extending over the drying table. The material to be dried is fed to and removed from the table by means carried by the radial arms and operated electrically through contacts carried by the frame and by the centre of the table.—W. F. F.

Dryer. R. Buskiewicz, Bythin. Ger. Pat. 293,153, Jan. 13, 1914.

A TAPERING drum mounted horizontally and having a helical groove on its outer surface, rotates inside a casing of similar shape, which is heated externally by fire gases or the like. The material to be dried is introduced at the wider end of the casing and travels along the helical groove to the narrower end. The distance between the drum and the casing is somewhat greater at the wider than at the other end, and the drum can be moved longitudinally so as to vary the space between it and the casing according to the nature of the material being dried.—A. S.

Vaporized volatile liquids from gaseous mixtures; Apparatus for separating. W. E. Lummas, Lynn, Mass. U.S. Pat. 1,189,711, July 4, 1916. Date of appl., Mar. 18, 1912.

THE mixture of gas and vapour is compressed, and the cooled and compressed mixture is washed to

remove condensed liquid. The washed compressed gas is then expanded in stages and is used to cool the compressed mixture in a heat-exchanging apparatus.—W. H. C.

Fire-extinguishing compounds. F. P. Harris, Cranford, N.J. U.S. Pats. (A) 1,190,160 and (B) 1,190,161, July 4, 1916. Date of appl., June 2, 1914.

THE compounds consist of (A) acetylene tetrabromide, carbon tetrachloride, and trichloroethylene; and (B) bromoform, carbon tetrachloride, and trichloroethylene, the bromoform being 10% of the total.—J. H. J.

Gas; Apparatus for charging liquor with. A. Dirian and W. Biel, Chicago, Ill. U.S. Pat. 1,191,952, July 25, 1916. Date of appl., Apr. 16, 1915.

A CLOSED, vertical, cylindrical tank is provided inside with a conical shell depending from the cover, and having at its apex a valve actuated by a float in the tank through the medium of a central vertical rod. Gas is admitted through the valve and liquid is also supplied to the apex of the cone, which is provided with internal oblique deflecting vanes.—W. F. F.

Filling material for absorption and reaction towers; Cylindrical. F. Raschig, Ludwigshafen. Ger. Pat. 292,622, May 6, 1915. Addition to Ger. Pat. 286,122.

THE cylinders (see Eng. Pat. 6238 of 1914; this J., 1914, 907) are made of cast metal or of ceramic material.—A. S.

Gases; Electrostatic method for the purification of. J. Kraus, Brunswick. Ger. Pat. 292,694, Jan. 8, 1914.

ELECTRODES of non-conducting material are used, of which the side not in contact with the current of gas is electrically charged, whilst the side in contact with the gas is either not charged or has a lower charge than the other side. For example, the electrode may be hollow and its outer surface charged electrically, whilst the gas is directed by guide-plates against the uncharged or less highly charged inner surface. The suspended particles in the gas are attracted to the charged or less highly charged face entirely or chiefly by charges induced from the other face.—A. S.

Stirring, agitating, or mixing liquids; Apparatus for. B. Goldman, Charlottenburg, Germany. U.S. Pat. 1,191,585, July 18, 1916. Date of appl., Feb. 18, 1914.

SEE Eng. Pat. 24,587 of 1913; this J., 1914, 469.

Drying mechanism; Vapour-removing apparatus for. W. R. Macklind, Assignor to G. A. Martin, trustee (Sherwin-Williams Co.), Cleveland, Ohio. U.S. Pat. 1,192,084, July 25, 1916. Date of appl., Aug. 4, 1915.

SEE Eng. Pat. 19,409 of 1913; this J., 1914, 849.

Emulsions; Production of. S. H. Blichfeldt, Southall, Assignor to Flakes A./S., Copenhagen. U.S. Pat. 1,192,492, July 25, 1916. Date of appl., Aug. 25, 1914.

SEE Eng. Pat. 23,653 of 1913; this J., 1914, 1167.

II A.—FUEL; GAS; MINERAL OILS AND WAXES.

Solvent naphtha; Export of. Board of Trade J., Aug. 24, 1916.

THE War Trade Department is now prepared to consider licences for the export of solvent naphtha

(provided that it contains less than 5% of toluol) to the British Colonies, United States, and allied countries with the exception of France.

Gas engines; Formation of deposits in—Spettmann. *Tech. Blätter*, 1915, 5, 131. *Chem.-Zeit.*, 1916, 40, Rep., 231.

DEPOSITS formed in gas engines owing to the use of unsuitable lubricating oils may be easily avoided, but deposits are also encountered, the formation of which is independent of the quality of the lubricating oil, but is greatly facilitated by the presence of sulphur vapour or sulphur dioxide in the gas. A black amorphous deposit, agglomerated into lumps, found in an engine using producer gas, contained 43% of tarry constituents soluble in ether, 13% of carbon, etc., insoluble in ether, 4.9% of free sulphur, 4.3% of combined sulphur, and 34.5% of ferric oxide. In laboratory tests it was found that sulphur combines with lubricating oil, and that the compounds formed are more easily decomposed by heat than the pure oil.—A. S.

Gas oils; Valuation and efficiency of—R. C. Downing. *J. Gas Lighting*, 1916, 135, 160—161.

COMMERCIAL gas oils consist largely of paraffins, but thirteen other kinds of hydrocarbons have also been found, in addition to small quantities of nitrogen, oxygen, and sulphur compounds. A good sample should not contain more than about 0.3% sulphur, but black oils from Texas, Mexico, and California frequently contain more than 1%. To ascertain the yield and quality of the gas obtainable under working conditions the author has subjected samples of the oil to destructive distillation in silica tubes, 30 to 48 in. long and 1 to 2 in. in diameter, heated to a regulated temperature, the oil being admitted from a burette at the upper end, and the gas passed through a condenser, scrubber, and meter into a holder at the other end. By plotting the total yields of gas and of illuminants in the gas per gall. of oil as abscissæ and the temperatures as ordinates, it was found that the yield increased up to 1300° to 1400° F. (about 700°—760° C.) and then steadily decreased. The bromine absorption afforded information as to the nature of the gas. Bromine combines with paraffins and naphthenes in sunlight, but not in the dark, whereas it is absorbed by unsaturated hydrocarbons under all conditions. Gas oil containing products from the "cracking" of crude petroleum shows a high bromine absorption. For gas-making the paraffins and naphthenes are the most valuable constituents. The nature of the products formed in the decomposition of octane and decane by heat has been investigated by Tocher (this J., 1894, 231). By extending the time of contact similar decompositions are effected at lower temperatures. At diminished pressure the yield of gas is increased, less free hydrogen is produced, and formation of carbon is prevented. Comparative tests indicated that the maximum candle power was obtained with gas produced at 1250° to 1300° F. (about 680°—700° C.), and the greatest calorific value at about 1400° F. (760° C.). Between 1250° and 1400° F. the photometric results varied 10%, whereas between 1350° and 1520° F. (about 730°—830° C.) the calorimetric value only varied 2%. At 1300° F. an oil should yield about 60% of gas, 30% of tar, and 10% of carbon and waste. The oil may also be tested in the presence of a suitable quantity of "blue" water-gas to reproduce working conditions. It was found that at low temperatures hydrogen was absorbed from the mixed gases. Methane increased steadily with the temperature; ethane appeared at 1200° F. (about 650° C.), and reached a maximum of 3 to 4% at 1400° F. The hydrogen sulphide was usually about 100 grains, about 70%

of which was derived from the coke and 30% from the oil. A contact time of 5 secs. showed 9% greater oil efficiency than one of 10 secs. A variation of 19% in the candle power and of 3% in the heating capacity was possible within the limits of 1½ and 10 seconds' contact. The gas obtained by short contact was nearly as stable as that obtained with longer contact. In the former case a hot fire in the generator was necessary; in the latter the "cracking" was carried too far. The illuminating efficiency increased with the feed of oil, up to 5 galls. per 1000 cb. ft., but decreased beyond that limit, whilst the B.Th.U. decreased with the input. The presence of carbon dioxide in the water gas reduced the yield of gas from the oil, and increased the amount of tar.—C. A. M.

Asphalts; Differentiation of natural—from industrial pitches. Hutin. *Caoutchouc et Gutta-Percha*, 1916, 13, 8994.

In general, natural products such as asphalts, bitumens, Judean pitch, etc., are insoluble in "bakelite A" (liquid form), whereas industrial pitches obtained as residues in the distillation of petroleum, coal, wood, fatty acids, etc., are soluble in all proportions when heated with that solvent for a short time on the water-bath.—C. A. M.

Montan wax. A. Grün and E. Ulbricht. *Chem. Umschau*, 1916, 23, 57—60. *Z. angew. Chem.*, 1916, 29, Ref., 371.

A SAMPLE of montan wax, containing 66% of montanic acid and 34% of unsaponifiable matter, was reduced by sodium and amyl alcohol, and the reduction product was saponified, and extracted with ether. An amorphous, transparent, neutral, unsaponifiable substance, resembling ceresin, was thus separated, which crystallised from ethyl acetate in small matted needles, m.pt. 59°—60° C. It is a secondary alcohol, montanol, which is formed from the ketone, montanone, forming the unsaponifiable constituent of the wax. Montanone, m.pt. 59.6° C., can be isolated directly from the wax. (See also this J., 1909, 878, 991).—A. S.

Olefines; Action of sulphur on—under pressure. W. Friedmann. *Petroleum*, 1916, 11, 693—697. *Z. angew. Chem.*, 1916, 29, Ref., 358.

THE action of sulphur on olefines under pressure was studied. From hexylene the compounds, $C_6H_{11}S$, sp.gr. 0.862 at 20° C, b.pt. 40°—41° C. at 10 mm.; $C_{11}H_{21}S$, sp.gr. 0.882 at 20° C, b.pt. 112°—113° C. at 10 mm.; $C_{12}H_{23}S$, sp.gr. 0.907 at 20° C, b.pt. 128° C. at 10 mm.; $C_{14}H_{29}S$, b.pt. 142° C. at 10 mm., and a hard asphalt of the composition, $C_{14}H_{29}S_2$, were isolated. Octylene yielded the compounds, $C_8H_{17}S$, sp.gr. 0.886 at 15° C, b.pt. 70°—71° C. at 13 mm.; $(C_8H_{17})_2S$, sp.gr. 0.903 at 15° C, b.pt. 163° C. at 13 mm.; and $C_{16}H_{33}S_2$. Hexadecylene yielded a compound, $C_{16}H_{33}S$, sp.gr. 0.927 at 22° C, b.pt. 188°—190° C. at 13 mm. It is considered that it is not the olefines, but feebly saturated or unsaturated cyclic compounds, including terpenes, that constitute the raw materials from which asphalts are formed.—A. S.

Unsaturated compounds [hydrocarbons]; Action of anhydrous aluminium chloride on—W. E. Henderson and W. C. Gangloff. *J. Amer. Chem. Soc.*, 1916, 38, 1382—1384.

DRIED acetylene is not absorbed by freshly prepared aluminium chloride at ordinary temperatures, but at 60°—62° C. dense vapours are produced and a reddish-brown sublimate changing to a black amorphous complex substance. Ethylene shows a similar behaviour. When acetylene is passed into a solution of aluminium chloride in absolute alcohol to complete saturation, small, colourless, well-defined crystals having the formula,

$\text{AlCl}_3, 2\text{C}_2\text{H}_2, 2\text{H}_2\text{O}$, separate after several days. These are very unstable and lose acetylene and hydrogen chloride on standing. Ethylene gives similarly an unstable, crystalline substance having the formula, $\text{AlCl}_3, 3\text{C}_2\text{H}_4, \text{H}_2\text{O}$.—T. C.

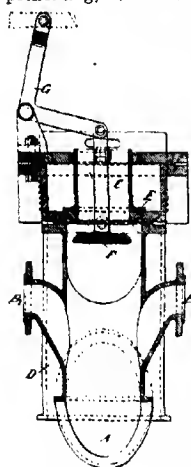
Determination of small quantities of sulphide sulphur. Drushel and Elston. See VII.

An adiabatic calorimeter. Daniels. See XXIII.

PATENTS.

Coke ovens; Reversing valve for regenerators for combined— O. Inrray, London. From M. G. Christie, British Expeditionary Force, France. Eng. Pat. 8945, June 17, 1915.

THE valve is used in conjunction with the oven described in Eng. Pat. 8944 (see following abstract). If used with coke-oven gas, which does not require preheating, branches B_1 and B_2 , are cut off from



the gas main by valves. In the position shown in the figure, the valve, F, is opened, admitting air through space, C, and pipe, A, to the regenerator. To reverse, the lever, G, is pulled to the left, closing the passage, C, lifting valve, E, and thus opening connection, D, from regenerator to chimney flue. All movements are carried out in correct sequence, air being cut off before any connection to chimney flue is made. If used with lean gas, valve, F, is drawn up to the body of the valve, E, by bolts. Then, alternately, lean gas is fed into the regenerators by pipes, B_1 and A , or waste heat leaves by the pipe, A, the opened valve, E, and pipe, D, to chimney flue.—J. E. C.

Coke oven; Regenerative— O. Inrray, London. From M. G. Christie, British Expeditionary Force, France. Eng. Pat. 8944, June 17, 1915.

THE oven is a modification of the Otto underfired oven adapted for the use of rich, lean or mixed gas in the flues. If worked as a regenerative

by the main, H. Air is delivered from the flue, G, through a special valve E, and regenerators, A_1 , to combustion chambers, F. The products of combustion pass down the flues on the right to the regenerators, A_2 , valve E_1 , and flue, G_1 , to the chimney. The direction of these currents is reversed at required intervals and the coke-oven gas is not heated. If lean gas is to be used, after preheating, it is fed into the main, C, and all the individual burner valves, K, are closed. During one period the gas passes by the main, H, to alternate valves, R, and regenerators, A_1 , and thence to combustion chambers, F. Alternate regenerator chambers are used for heating gas and air respectively, the two meeting in the combustion chambers. The reversing is carried out as in the former instance.—J. E. C.

Coke; Process of making— H. W. Buhler and C. J. Emerson, Assignors to G. D. Haskell, Boston, Mass. U.S. Pat. 1,191,943, July 25, 1916. Date of appl., Nov. 7, 1914.

COAL is subjected to a partial coking in a closed oven to expel the more volatile substances under conditions preventing combustion, and the by-products are extracted from the gases. The purified gas is then burnt by means of air under pressure in the oven chamber itself to complete the coking.—J. E. C.

Coke; Process of cooling—by means of inert gases. Wärme-Verwertungs-Ges., Siemensstadt. Ger. Pat. 287,043, June 21, 1914.

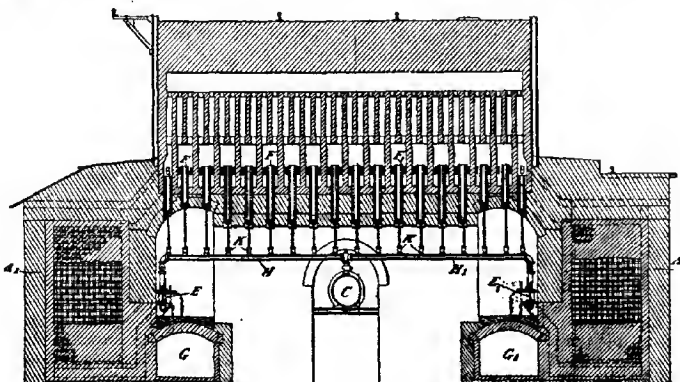
THE mass of coke is discharged from the oven into a chamber where it is cooled by a current of inert gases. Movable hinged plates are provided which shut off the free space in the chamber around the mass of coke, so that the gases are forced to pass through the coke; and the passage of the gases may be facilitated by breaking up the mass of coke.—A. S.

Acetylene gas; Storing compressed or dissolved— T. G. Allen, London. Eng. Pat. 100,911, May 29, 1916. (Appl. No. 7617 of 1916.)

ACETYLENE gas, dissolved in a solvent such as acetone, absorbed in a porous material, may be stored safely under pressure. The invention comprises the use of materials of the class known as kapok for the absorbing material.—J. E. C.

Gas generator. D. D. Barnum, Worcester, Mass., Assignor to The Ritter-Conley Manufacturing Co., Pittsburgh, Pa. U.S. Pat. 1,192,729, July 25, 1916. Date of appl., Dec. 20, 1913.

HORIZONTAL retorts are arranged in vertical rows.



oven the main, C, delivers coke-oven gas for one period to the left-hand series of burners fed

Each retort is coupled on the right and left to two vertical stand-pipes. One of these stand-pipes

is coupled to a rich gas main, the other to a poor gas main. By means of valves, the gases from the retorts may be selectively delivered to different receptacles at will.—J. E. C.

Natural gas; Process for extracting light liquefiable hydrocarbons from —. E. D. Kendall, Elizabeth, N.J., Assignor to W. A. Megrath, Brooklyn, N.Y., and exors. of J. B. Haggin. U.S. Pat. 1,192,529, July 25, 1916. Date of appl., Dec. 4, 1912.

LIQUID hydrocarbons heavier than gasoline are sprayed into a current of natural gas. The mixture of gases and sprayed particles is then passed through screens of varying mesh, causing the liquid particles to coalesce and releasing the fixed gases.—J. E. C.

Heavy oils, oil residues, and bitumens; Distillation of —. W. A. Hall, New York. Eng. Pats. 4598, Mar. 24, 7200, May 13, and 7778, May 25, 1915.

THE oil is mixed with not less than its own weight of coke or similar porous material and heated by external heat to about 475° C., and the vapours are condensed. Thus the coke may be heated in a retort into which the oil is constantly introduced in regulated proportion, the admixture being effected by means of a helical screw. Under these conditions the distillates of low boiling point closely correspond in composition, whatever the nature of the original crude oil.—C. A. M.

Heavy oils, oil residues, and bitumens; Distillation of —. W. A. Hall, London. Eng. Pat. 8836, June 15, 1915. (See preceding abstract.)

COKE or other combustible porous material is contained in a vertical retort and is kept burning at its lower end. Heavy oil, oil residue, or bitumen, in quantity less than the weight of the coke, is admitted to the hot mass at a point where the temperature is about 490° C., and subjected to the action of the rising non-oxidising combustion products. A uniform quality of lighter oils is distilled off and condensed.—W. F. F.

Heavy hydrocarbon oils; Cracking —. W. Higgins, London. Eng. Pat. 9418, June 28, 1915.

THE crude oil is made to pass through an undulating pipe of copper or other metal which is constructed in loops or bends, each of which is heated by means of a Bunsen burner or other device. The oil vapours leaving the pipe are condensed in a suitable condenser.—C. A. M.

Gasoline; Process of making —. F. S. Low, New York. U.S. Pat. 1,192,653, July 25, 1916. Date of appl., Apr. 24, 1913.

HIGH boiling oils are converted into lower boiling oils by spraying them against a plate having a surface of catalytic material. This plate is maintained at a temperature sufficiently high to crack the high boiling oils without forming substantial amounts of gas and is situated in a vessel of lower temperature. The high boiling petroleum material is atomised by hydrogen under pressure and the vapours of low boiling products from the vessel are condensed and collected.—J. E. C.

[Lubricating] oil; Process for purifying —. W. F. Garrity and A. Jarvis, Bayonne, N.J. U.S. Pat. 1,190,538, July 11, 1916. Date of appl., June 1, 1914.

LUBRICATING oil is boiled and filtered through sheets of cotton held between sheets of Turkish towelling, or through alternate layers of such filtering medium and of fuller's earth.—C. A. M.

Asphaltic compounds; Separation of — from gangue. C. L. Cook, San Francisco, and J. R. Price, Oakland, Cal. U.S. Pat. 1,190,633, July 11, 1916. Date of appl., Feb. 17, 1914.

THE gangue is heated in water to a temperature

sufficient to cause the asphaltic substances to separate partially and rise to the surface. The temperature is then raised to, say, 250° F. (about 120° C.) so as to cause the asphalt particles to coalesce, whereby the entangled particles of gangue are released and fall to the bottom.—C. A. M.

Distilling petroleum, tar, or other substances under vacuum; Apparatus for —. L. Steinschneider, Brünn, Assignor to P. Porges, Vienna, and R. Neumann, Brünn, Austria-Hungary. U.S. Pat. 1,192,581, July 25, 1916. Date of appl., Oct. 8, 1914.

SEE Eng. Pat. 20,353 of 1914; this J., 1915, 1133.

Apparatus for burning lime [using lignite as fuel] —. U.S. Pat. 1,191,752. See VII.

IIa.—DESTRUCTIVE DISTILLATION; HEATING; LIGHTING.

PATENTS.

Reducing [pine] stumps; Process and apparatus for —. A. T. Ratliff, Hattiesburg, Miss., Assignor to Free Stump Remover Manufacturing Co., Laurel, Miss. U.S. Pat. 1,190,006, July 4, 1916. Date of appl., June 11, 1915.

A PORTABLE retort is placed over the stump in the ground, heat is applied, and the vapours are led to a condenser. The retort is enclosed in a casing, and a forced draught device is provided for supporting combustion in the intermediate space.—A. S.

Wood-distilling apparatus. J. W. Spurlock, Folkston, Ga. U.S. Pat. 1,190,478, July 11, 1916. Date of appl., Feb. 25, 1916.

DISTILLING chambers are arranged on opposite sides of the longitudinal centre of a rectangular casing, and flues are provided between the chambers, and between the chambers and the side walls and one end wall of the casing. Two furnaces at one end of the casing communicate with the outer longitudinal flues and the transverse flue, and one furnace at the other end communicates with the central flue. Stacks are provided at the ends of the flues opposite the furnaces, and doorways at the end of the distilling chambers opposite the transverse flue. The flues are divided into upper and lower sections by horizontal longitudinal partitions.—A. S.

"Volatiles" from coals, shales, lignites, etc.; Method and apparatus for extracting — and for refining the same. C. C. Bussey, New York, Assignor to Coal By-Products Co. U.S. Pats. 1,191,869 and 1,191,870, July 18, 1916. Date of appl., May 12, 1914.

THE material is fed progressively into the top of a deep conical retort. Suitable gases at a temperature of 800° F. (about 430° C.) are admitted from a furnace at the bottom by means of a circumferential flue to the interior of the retort. These gases pass upwards round the particles of material and expel the volatile constituents, without producing any chemical action in the material. Volatile matter and gases are withdrawn from the top of the retort, whilst the solid residue is withdrawn from the bottom by means of an endless conveyor.—J. E. C.

Exhaust steam; Utilising — for heating purposes —. L. J. R. Bouhon, Cheltenham. Eng. Pat. 11,018, July 29, 1915.

EXHAUST steam is led through a regulating chamber to a system of heating coils in a chimney, or flue, etc. The reheated and dried steam is utilised in any heating or drying operation, and is then led

to the condenser, and condensed in the usual manner. The circulation of the exhaust steam may be assisted by an injector-compressor operated by live steam. A perforated pipe is provided through which steam or air is blown to clean the outside of the heating coils.—J. E. C.

Gas furnaces. E. W. Harvey, London. Eng. Pat. 17,543, Dec. 15, 1915.

To attain more uniform heating in steel furnaces, glass furnaces, etc., and to secure better admixture of gas and air near the flame port, air ports are so situated on each side of the gas port that the air issues from the ports in a direction at right angles to the gas currents. Contraction of the area of the gas port by inclining the sides, etc., brings about compression of the gas before it mixes with the air. Alternatively the air port may have inclined sides and be situated between gas ports. A mixing chamber is situated in front of the gas and air ports and is so constructed as to compress the mixed gases before admitting them to the furnace proper.—J. E. C.

Flaming arcs; Production of stable. Planawerke A.-G. für Kohlenfabrikation, Ratibor. Ger. Pat. 293,158, Mar. 7, 1914.

The negative electrode is made from a carbon mixture containing at least 30% of graphite and having as low an electrical resistance as possible.—A. S.

Oils, spirits, and gases from peat or other materials; Method and apparatus for obtaining. A. N. Macnicol, Melbourne, Australia. Eng. Pat. 11,481, Aug. 9, 1915.

SEE U.S. Pat. 1,165,889 of 1915; this J., 1916, 247.

Tungsten filaments; Making. E. Aeuer, Berlin, Assignor to General Electric Co., New York. U.S. Pat. 1,191,552, July 18, 1916. Date of appl., Aug. 10, 1910.

SEE Fr. Pat. 421,427 of 1910; this J., 1911, 410.

Process for coagulating latex by wood distillation gases. Eng. Pat. 11,615. See XIV.

III.—TAR AND TAR PRODUCTS.

Naphthalene; Thermal decomposition of the aliphatic hydrocarbon derivatives of. [Formation of benzene and toluene.] G. Egloff. Met. and Chem. Eng., 1916, 15, 125—127.

The oil used consisted mainly of alkyl and alkylene derivatives of naphthalene, and was obtained from a tar oil by removing the tar acids and bases in the usual manner and afterwards extracting naphthalene and anthracene by refrigeration. On distillation, the purified oil yielded 6.3, 75.0, 15.0, and 3.1% by volume of fractions boiling between 150° and 200°, 200° and 250°, 250° and 300°, and 300° and 325° C. respectively, the specific gravities of these fractions at 15.5° C. being 0.953, 0.995, 0.999, and 0.998 respectively. Cracking was effected by passing the oil at a definite rate through an electrically heated tube, the experiments being conducted at 600°, 650°, and 700° C. under pressures of from 1 to 14 atmospheres. The decomposition of the oil was considerably influenced by both temperature and pressure, but more particularly by the former; an increase in both resulted in an increased formation of carbon, of which latter a quantity corresponding to 29% of the original oil was produced at 700° C. and 14 atmospheres. The yield of benzene and toluene in the recovered oil increased with temperature, that of toluene increasing to a maximum

and then decreasing as the temperature and pressure increased. The maximum benzene formation, 3.2% by volume of the original oil, was obtained at 650° C. and 14 atmospheres pressure. The proportion of toluene produced at 600° C. and 14 atmospheres, and at 650° C. and 11 atmospheres, was 2% by volume of the original oil. The formation of benzene and toluene is assumed to take place by (1) direct decomposition of methylnaphthalenes, (2) formation and subsequent decomposition of xylenes, and (3) by synthesis from acetylene and allylene, the three reactions occurring successively or simultaneously.

—W. E. F. P.

Differentiation of natural asphalts from industrial pitches. Hutin. See IIA.

Existence of trisulphur dichloride. Richter. See VII.

PATENTS.

Tar; Apparatus for vaporising liquids, especially. H. Vogt-Gut A.-G., Arbon, Switzerland. Ger. Pat. 202,195, July 14, 1915.

A PEAR-SHAPED rotary still is mounted in a furnace setting in an inclined position, and the preheated tar is supplied continuously through a passage in the neck. The tar flows down the neck, in counter-current to the issuing vapours, to the more strongly heated enlarged part of the still. A bent pipe passing through the lower end of the still, and which can be turned by a handle, serves for running off the liquid pitch, the flow being controlled by a tube passing through the still and connected at one end with the bent pipe and at the other end with the outer air.—A. S.

Amines; Manufacture of aromatic. J. Y. Johnson, London. From Badische Anilin u. Soda Fabr., Ludwigshafen, Germany. Eng. Pat. 5692, Apr. 15, 1915. Addition to Eng. Pat. 13,149, May 28, 1914 (see Ger. Pat. 282,568 of 1913; this J., 1915, 703).

The copper to be used as catalyst is prepared by reducing, at a temperature below a red heat, copper oxide prepared by precipitating a solution of a copper salt, and not pyrogenetically as claimed in the main patent. *Example:* Hot caustic soda solution is added gradually to a solution of 1180 grms. of copper nitrate crystals, 38 grms. of silver nitrate, and 252 grms. of magnesium nitrate crystals, and the precipitate washed; 130 grms. of pumice-stone lumps is treated with 20 grms. of the precipitate, a small amount of water, and then 20 grms. of 40% sodium silicate solution added, and the pasty mass obtained heated at 200° C. in a current of hydrogen; on passing a mixture of hydrogen and nitrobenzene vapour over this catalyst at 200°—210° C., aniline is produced.

—F. W. A.

Aniline, other aromatic amines, or other bodies involving catalytic hydrogenation [reduction]; Manufacture of. J. Y. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 6409, Apr. 29, 1915. (Compare Eng. Pat. 13,149 of 1914; this J., 1915, 790.)

CATALYTIC hydrogenation (reduction) is effected by employing carbon monoxide or gases containing carbon monoxide together with water vapour at comparatively low temperatures. *Example:* Nitrobenzene vapour mixed with an excess of a reducing gas containing at least one volume of water vapour for each three volumes of carbon monoxide is passed over a contact mass containing copper, e.g., obtained by coating 130 grms. of pumice stone with a mixture of 24.3 grms. of cupric carbonate, 2.7 grms. of zinc carbonate, and 20 grms. of concentrated sodium silicate solution and

reducing at a low temperature; the temperature is maintained at 200°–220° C. during the reaction; a good yield of aniline is produced.

—F. W. A.

Organic chemical process. [Hydroxy-compounds; Manufacture of aromatic —.] C. Ellis, Montclair, N.J., Assignor to Ellis-Foster Co. U.S. Pat. 1,191,880, July 18, 1916. Date of appl., Mar. 18, 1916.

AROMATIC hydrocarbons are sulphonated by means of strong sulphuric acid maintained in a practically anhydrous condition, and the sulphonated material is neutralised by means of sodium carbonate; the dried sodium sulphonate is fused with caustic soda, and gases containing carbon dioxide are passed into an aqueous solution of the fused material; the sodium carbonate liquors are separated and employed to neutralise the acid sulphonated material.—F. W. A.

9.10-Dihalogenanthracene- β -monosulphonic acids; Preparation of —. Farbw. vorm. Meister, Lucius, u. Brünig. Ger. Pat. 292,530, Sept. 11, 1914.

9.10-DIHALOGENANTHRACENES are sulphonated with oleum in the presence of an inert substance, e.g., nitrobenzene.—A. S.

Anthraquinone; Preparation of —. Farbw. vorm. Meister, Lucius, u. Brünig. Ger. Pat. 292,681, June 23, 1914.

ANTHRAQUINONE is prepared by heating anthracene, dissolved or suspended in a neutral or alkaline medium, with oxygen under pressure in presence of a catalyst. For example, 100 parts of a 30% aqueous anthracene paste is mixed with 3000 parts of water, 250 parts of 25% ammonia, and 5 parts of copper oxide in a vessel capable of resisting pressure, a quantity of oxygen corresponding to 3 atoms per mol. of anthracene, or the corresponding quantity of air, is forced in, and the mass is stirred and heated for 20 hours at 170° C. After cooling, the anthraquinone is separated and freed from copper compounds by washing with ammoniacal water. Nickel, cobalt, iron, and lead compounds may be used as catalysts instead of copper oxide.—A. S.

IV.—COLOURING MATTERS AND DYES.

Chlorophyll-like colouring matter; Alleged synthesis of a —. T. Jona. Monit. Scient., 1916, 6, 149–150.

THE author questions the identity of the colouring matter prepared by Albert and Mary (this J., 1915, 790) with chlorophyll. The colour reactions described are quite inconclusive, and the spectrum described is not the well-known spectrum of chlorophyll, and any resemblance to spectra of impure specimens of chlorophyll may be attributed to chance. Moreover, the formula ascribed to the synthetic chlorophyll and the equation representing its formation are not supported by the experimental observations.—C. A. M.

Mononitrophenyl ethers. H. I. Jones and A. N. Cook. J. Amer. Chem. Soc., 1916, 38, 1534–1550.

THE *o*- and *p*-nitrophenyl ethers were prepared by the action of potassium phenoxide on *o*- or *p*-bromonitrobenzene in the absence of a solvent, according to the equation, $(\text{NO}_2)\text{C}_6\text{H}_4\text{Br} + \text{C}_6\text{H}_5\text{OK} = (\text{NO}_2)\text{C}_6\text{H}_4\text{O.C}_6\text{H}_5 + \text{KBr}$. The phenoxide was prepared by the addition of molten potassium hydroxide to molten phenol, whereby a snow-white product was obtained. The *o*-nitrophenyl ether

is a yellow liquid at all temperatures down to –80° C.; it boils at 195°–197° C. at 45 mm. pressure, with partial decomposition, is readily converted into a rather unstable, hygroscopic monosulphonic acid, m. pt. 90° C. (with decomp.), and on reduction with tin and hydrochloric acid is reduced to *o*-aminophenyl ether. *p*-Nitrophenyl ether and its derivatives are much more stable than the corresponding *o*-compounds. The ether forms crystals, m. pt. 123.5° C., and sublimes and distils unchanged. Its sulphonic acid can be obtained only by the action of fuming sulphuric acid, but it is more readily reduced than its isomeride to the amine, which melts at 95° C. Both the sulphonated and unsulphonated amines of the *o*- and *p*-series were converted into azo-dyes of which a full description is given. It was observed in general that the *o*-aminophenyl ether dyes tend mostly to reds and browns, though a few purple and yellow dyes were obtained. The *o*-dyes are more brilliant than the *p*-dyes, whilst the sulphonated dyes are less brilliant than the unsulphonated.—G. F. M.

Triarylcannabinols; Tautomerism of —. M. Gomberg and N. E. Van Stenc. J. Amer. Chem. Soc., 1916, 38, 1577–1606.

VARIOUS substituted derivatives of *p*-hydroxytriphenylcarbinol, containing the substituent (OH , OCH_3 , Cl , Br) in the ortho position with respect to the hydroxyl group, were prepared by condensation of benzophenone chloride with ortho-substituted phenols. In some cases no catalyst was required, but in others the yields were increased by the use of aluminium chloride. All the products, like *p*-hydroxytriphenylcarbinol itself (see Gomberg, *ibid.*, 1913, 1035), were found to exist in two crystalline desmotropic modifications, one coloured and possessing a quinonoid (quinocarbonium) structure, and the other colourless and doubtless the true benzenoid carbinol. The colourless form was obtained by dissolving the substance in alkali, precipitating by carbon dioxide, and crystallising from benzene, ether, or alcohol, whilst the coloured form was prepared by crystallising from 60–70% acetic acid after heating with the solvent for some time if necessary. Transformation of the colourless into the coloured modification occurred under the influence of heat or light. The coloured form invariably possessed a lower melting point than the colourless one, and also underwent dehydration much more readily, yielding the corresponding fuchsone.—J. H. L.

Desoxyhydrocatechin-tetramethylether. H. Ryan and M. J. Walsh. Scient. Proc. Roy. Dublin Soc., 1916, 15, 113–120.

VERATROYL chloride (m. pt. 68°–69° C.), obtained by the action of thionyl chloride on veratric acid (m. pt. 178°–180° C.) prepared from vanillin, was condensed with the ethyl homologue of phloroglucinol-trimethylether, prepared by a slight modification of the method of Herzig and Erthal (Monatsh. Chem., 1911, 32, 451); reduction of the resulting veratroyl-ethylphloroglucinol-trimethylether (m. pt. 123°–124° C.) by means of sodium and alcohol should yield 3-ethyl-2.4.6.3'.4'-pentamethoxydiphenylmethane, identical with desoxyhydrocatechin-pentamethylether in case the coumarane formula of von Kostanecki and Lampe (Ber., 1907, 40, 720) for catechin is correct; the oil obtained, however, resisted all attempts to crystallise it, even when inoculated with the pentamethylether prepared according to the method of von Kostanecki and Lampe; hence it has not been possible to decide between the coumarane formula and the chromane formula of Perkin and Yoshitake (Chem. Soc. Trans., 1902, 81, 1169) for catechin.—F. W. A.

PATENTS.

Acid wool dyestuffs indifferent to copper; Manufacture of —. O. Imray, London. From Soc. Chem. Ind. in Basle, Switzerland. Eng. Pat. 12,249, Aug. 25, 1915. Addition to Eng. Pat. 1611 of 1915 (this J., 1916, 301).

THE dyestuffs obtained by combining *o*-diazophenol or -naphthol derivatives with β -ketone-aldehyde derivatives in which the aldehyde hydrogen is replaced by an alkyl, aryl, alkoxy, or arylamino group, e.g., aceto- or benzoyl-acetic ester, acetyl- or benzoyl-acetone, or aceto- or benzoyl-acetanilide, or with benzoylacetic-*o*-carboxylic acid, or with such multinuclear isocyclic or heterocyclic ring compounds as contain a CH_2 group capable of coupling, e.g., diketohydroindene, perinaphthindandione, 3-hydroxy-1-thionaphthene, kotocoumarane, or indoxyl, are converted into compounds containing copper as described in the main patent. The dyestuffs produced are soluble in water, are indifferent to copper, and dye animal fibres direct from an acid bath bright greenish-yellow, orange-brown, brown, red, violet, blue to black tints fast to washing and to light. *Example*: 21 grms. of the dyestuff obtained by combining diazotised 1.2.4-aminonaphtholsulphonic acid with hydroxythionaphthene is dissolved in 700 grms. of water, and a solution of 13 grms. of copper sulphate in 50 grms. of water added at 70° C.; the blue copper compound precipitated is neutralised with sodium carbonate, separated, and dried; it gives on wool from an acid bath very pure violet-blue dyeings fast to washing, alkali, and light.—F. W. A.

Phthaleins and their halogen derivatives containing selenium; Preparation of —. Farb. vorm. Meister, Lucius, u. Brüning. Ger. Pat. 291,883, Apr. 4, 1914. Addition to Ger. Pat. 290,540.

PRODUCTS similar to those described in the chief patent (this J., 1916, 595) are obtained by the use of selenium oxychloride instead of selenium chlorides.—A. S.

Aminoanthraquinone-sulphonic and -carboxylic acids; Preparation of —. Act.-Ges. f. Anilinfabr. Ger. Pat. 293,100, June 3, 1914.

HALOGENANTHRAQUINONE-SULPHONIC or -carboxylic acids are condensed with arylsulphamides by heating in aqueous alkaline solution, and the arylsulpho group is eliminated from the resulting arylsulphamino compounds. The products are dyestuffs or may be converted into dyestuffs.—A. S.

Sulphur dyestuffs; Preparation of —. Farb.-fabr. vorm. F. Bayer und Co. Ger. Pat. 293,101, Sept. 25, 1913.

THE ethylene or ethyl derivatives of amines of the benzene, diphenyl, or naphthalene series are fused at a high temperature with sulphur and benzidine or its homologues or analogues. The resulting sulphur dyestuffs give reddish-brown shades which on treatment with dilute acids are changed to clear yellow shades of great fastness to boiling, to chlorine, and to cross dyeing.—A. S.

Sulphur dyestuffs; Preparation of yellow —. Farb.-fabr. vorm. F. Bayer und Co. Ger. Pat. 293,187, Feb. 23, 1915. Addition to Ger. Pat. 292,148.

SULPHUR dyestuffs are prepared, as described in the chief patent (this J., 1916, 832), from mixtures of benzidine with *N*-diacetyl derivatives of primary diamines of the diphenyl series methylated in the nucleus, or with nitro- or amino-substitution products of these diacetyl derivatives. The products give somewhat redder shades of yellow than the dyestuffs obtained from the non-acetylated diamines.—A. S.

Trisazo dyestuffs; Manufacture of —. Farb.-fabr. vorm. F. Bayer und Co. Ger. Pat. 293,184, Mar. 7, 1914.

DIAZO compounds of the benzene or naphthalene series are converted into trisazo dyestuffs in the usual way, using as end component 2-amino-8-hydroxynaphthalene-6-sulphonic acid in a faintly acid solution or a solution made alkaline with bicarbonate. The dyestuffs are faster to light than the commercial disazo dyestuff, Neutral Grey, obtained by coupling diazotised aniline with *o*-naphthylamine, again diazotising, and coupling with 2-amino-8-naphthol-6-sulphonic acid.—A. S.

V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Textile fabrics; Determination of the permeability to heat of —. O. Bauer. Mitt. K. Materialprüf., 1915, 33, 290—305.

A SIMPLE method of determining the permeability to heat of textiles, paper, etc., is described. A copper bottle with a flat bottom of 5.5 cm. diameter, surrounded by a layer of cotton wool and an insulating casing, rests on a piece of felt on a wooden block. The bottle is provided with a thermometer and contains 200 c.c. of hot water; steam is passed through it until the temperature reaches 100° C., when the junction of an iron-constantan thermo-element is placed between the bottom of the copper bottle and the piece of felt, and the temperature noted by means of a galvanometer at intervals of 2 mins. during a period of 90 mins. A similar test is made with a piece of the material under examination placed between the bottom of the bottle and the felt. Curves are plotted with temperature and time as co-ordinates, and the ratio $F+f$, where F and f are the areas inclosed by the curves obtained in the "blank" test and in the test with the textile or other material, is called the "heat-protection number" of the material. Tests with a number of different textile fabrics showed that there is no definite relation between the "heat-protection value" of a material and its nature, thickness, specific gravity, etc., and the relative values of different fabrics for protection against cold can only be ascertained by actual tests on the materials.—A. S.

Nitro-fibroin; Hydrolysis of — with hydrochloric acid. T. B. Johnson and A. J. Hill. J. Amer. Chem. Soc., 1916, 38, 1392—1398. (See also this J., 1915, 1047.)

FIBROIN when treated for a long time at ordinary temperatures with nitric acid of sp.gr. 1.12, yields 70% of its weight of nitro-fibroin, an orange-coloured powder of definite composition, $\eta_{\text{sp}} = 43.39^\circ$ to 44.10° in aqueous hydrochloric acid solution. On prolonged hydrolysis with concentrated hydrochloric acid at 120°—130° C., nitro-fibroin yields 5.74% of optically inactive 3-nitrotyrosine as the hydrochloride, m.pt. 237° C., 25.36% of glycocholl, and 10% of optically inactive alanine, together with end products of oxidation reactions, such as oxalic acid and ammonium nitrate.—T. C.

Hat bodies prepared from rabbits' fur; Chemical study of —. E. A. Romegialli. Annali Chim. Appl., 1916, 5, 305—338.

THE composition of the hat bodies, before bleaching and dyeing, was found to be: carbon, 40.98; hydrogen, 0.88; nitrogen, 16.33; sulphur, 3.17; sulphur present as sulphuric acid, 0.88; phosphorus, 0.13; ash, 0.45; water (loss at 100° C.), 11.47; oxygen (by difference), 16.71%. The ash contained: SiO_2 , 34.75; Al_2O_3 , 20.34; Fe_2O_3 ,

3.17; P_2O_5 , 6.14; CaO , 7.14; MgO , 3.35; CuO , 10.44; CO_2 , SO_2 , Na_2O , K_2O , etc. (by diff.), 14.67%. When the fur is treated with acid mercuric nitrate solution in the "carroting" process, in order to improve its felting properties, it appears to combine chemically with mercury. If the treated fur be boiled with water, the solution after being concentrated does not give a reaction for mercury, but mercury can be detected by the usual reactions after treating the fur with concentrated nitric acid. For bleaching the hat bodies preparatory to dyeing, the most satisfactory results are obtained with hydrogen peroxide in presence of a small quantity of sodium carbonate. Tests of the physical properties of the hat bodies, experiments on the action of nitric and sulphuric acids, water at high temperatures, and bleaching powder, and laboratory dyeing tests with synthetic dyestuffs are described.—A. S.

Imitation parchment and "pergamyn" papers; Test for grease-proof properties of— C. Bartsch. Mitt. K. Materialprüf., 1915, 33, 441–445.

THE "blister" test and the oil of turpentine test commonly employed for grease-proof papers have been the subject of controversy as to their relative validity, and both possess the disadvantage of standing in no direct relation to the actual use for which the paper is required and of being incapable of numerical comparison. In devising a quantitative method it was preferred, therefore, to employ butter or lard as the greasy medium, and standards had to be fixed to express the degree and time of resistance. In the test now prescribed, sheets of the grease-proof paper, 13×18 cm. in size, are smeared with a layer of fat 1 mm. thick and 25 sq. cm. in area. The fat is applied by means of a zinc template having a square hole of the correct area, and the excess is scraped off with a celluloid straight-edge. The treated paper is laid on a sheet of white engine-sized notepaper and supported on a glass plate, another glass plate loaded with a 500 grm. weight being superposed. The results are classified by an examination of the sheet of notepaper after a given time as follows:—(0) Perfectly grease-proof, no stains or only one or two stains due to minute pinholes; (1) Grease-proof, not more than 15 small, practically isolated stains; (2) Fairly grease-proof, between 15 and 50 small stains, mostly isolated; (3) Slightly grease-proof, numerous stains, largely confluent, covering about half the area under treatment; (4) Not grease-proof, stains spreading over the greater portion of the area. A large number of observations have shown that lard has a greater penetrating power than butter, consequently lard has been suggested as the standard reagent and one hour as the standard time. None of the imitation parchment or pergamyn papers possesses grease-proof properties approaching those of the real vegetable parchments, but the degree of resistance may be determined in relation to the purpose for which the paper is required in a manner similar to the ink-resistance of sized writing papers.—J. F. B.

Determination of small quantities of sulphide sulphur. Drushel and Elston. See VII.

Utilisation of crude wool fat in the soap industry. Schrauth. See XII.

Red prussiate for blue print paper. See XXI.

PATENTS.

Waste silk materials; Extraction and recovery of loading ingredients from— E. Beisenherz, Essen-Ruhr, Germany. Eng. Pat. 11,186, Aug. 3, 1915. Under Int. Conv., Aug. 3, 1914.

In the process of extracting tin from loaded silk

by the action of oxalic acid or acid oxalates (Eng. Pat. 4901 of 1915; this J., 1916, 596), the presence of salts of alkalis, alkaline earths, and aluminium in the waste silk material causes an excessive consumption of oxalic acid and interferes with its recovery. This difficulty is overcome by subjecting the waste silk to a preliminary treatment in a 1–2% solution of hydrochloric or other mineral acid at 40° – 50° C., which removes basic matters without dissolving more than traces of the tin.—J. F. B.

Drying textile fabrics, paper, and other materials of a continuous character; Means for— W. W. Beaumont and L. N. Burt, London. Eng. Pat. 16,004, Nov. 12, 1915.

THE fabric travels in a zigzag path over a series of rollers enclosed in a chamber, and hot air is passed over it from two sources independently, one inlet and outlet being near the entrance for the fabric and the others near the outlet for the fabric. The more volatile constituents of the liquid saturating the fabric are thus carried off by the first air current and may be recovered by condensation, while aqueous vapour is separately removed by the second air current.—W. F. F.

Plastic composition. W. A. Beatty, New York. U.S. Pat. 1,158,356, June 20, 1916. Date of appl., Apr. 16, 1915.

THE composition consists of a cellulose ester (nitrocellulose), a crystalline condensation product of a hydroxy derivative of an aromatic hydrocarbon (dihydroxydiphenyldimethylmethane), a camphor substitute, and a solvent (amyl acetate, with or without acetone).—E. W. L.

Pulp and the like for use in the manufacture of paper; Apparatus for bleaching— T. H. Nash, St. Paul's Cray, Kent. Eng. Pat. 100,993, May 23, 1910. (Appl. No. 7325 of 1916.)

THE pulp is charged by means of a conveyor through a backwardly inclined, open-ended trough containing bleach liquor, into the first of a series of concrete containers, preferably with semi-cylindrical bottoms, provided with agitators carried by horizontal shafts. The containers may be arranged either in step-formation or vertically one above the other and are connected together at their upper parts by overflow conduits, so that the overflow level from each container is lower than that from the container immediately preceding it. The overflow orifices are preferably arranged alternately at opposite corners of the containers, and valves are provided in the bottoms for discharging the whole contents of the system, if desired, and for flushing purposes. The bleached pulp overflowing from the last container is diluted with water so that it may be delivered through a pump.—J. F. B.

Paper making machines; Fourdrinier— E. C. R. Marks, London. From Rice, Barton and Fales Machine and Iron Co., Worcester, Mass., U.S.A. Eng. Pat. 10,523, July 20, 1915.

THE frame of a Fourdrinier paper machine of the non-shaking type is provided with a number of supporting surfaces on which table sections carrying the table rolls are directly supported. On the frame are placed a number of transverse rails which may be removable, and the tables are provided with supporting wheels normally out of contact with the rails. By the operation of rotary cams the rails may be moved upwards to engage the wheels and lift the table sections off the supporting surfaces so that they may be removed transversely along the rails. Additional rails are provided in alignment with the transverse

rails, outside the frame, to receive the tables when they are removed from the machine for changing a wire.—J. F. B.

Paper and similar material; Treatment of—. H. C. Mitchell, London. Eng. Pat. 12,873, Sept. 8, 1915.

A SURFACE coating of graphite, lampblack, or other colour, removable by means of indiarubber, is applied in the form of a powder to paper by means of a bronzing or other equivalent machine, and the excess of powder is removed by brushing.—J. F. B.

Cellulose esters; Process for the preparation of new—. J. Koetschet and M. Theumann, Lyon, Assignor to Soc. Chim. des Usines du Rhône, Paris. U.S. Pat. 1,191,439, July 18, 1916. Date of appl., Sept. 5, 1914.

SEE Eng. Pat. 10,822 of 1915; this J., 1915, 1086.

Plastic substances from the derivatives of cellulose; Process of manufacturing—. F. Lehmann and J. Stocker, Berlin. U.S. Pat. 1,191,801, July 18, 1916. Date of appl., Mar. 16, 1914.

SEE Fr. Pat. 469,925 of 1914; this J., 1915, 25.

Pulp-digesters; Method of removing scale from heating apparatus for—. E. Morterud, Jeldøen, Norway. U.S. Pat. 1,191,451, July 18, 1916. Date of appl., Aug. 6, 1914.

SEE Ger. Pat. 278,827 of 1913; this J., 1915, 276.

Acid magnesium sulphite solution; Production of an— for the manufacture of sulphite-cellulose. J. L. Jardine, Penicuik, Scotland. U.S. Pat. 1,192,640, July 25, 1916. Date of appl., Jan. 29, 1916.

SEE Eng. Pat. 2509 of 1915; this J., 1916, 533.

Process for converting cellulose into fermentable carbohydrates. Ger. Pat. 292,482. See XVIII.

VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Silk; Theories of the weighting of— and their present position. P. Heermann. Mitt. K. Materialprüf., 1915, 33, 446—453.

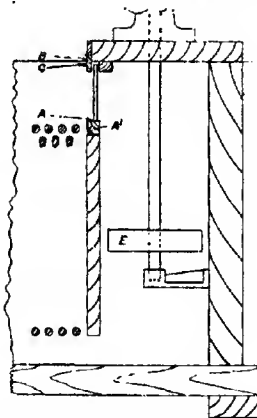
THE phenomena of dyeing, mordanting, and weighting may be classified as primary or substantive and secondary or adjective, and whereas the latter are generally explainable on the basis of salt or lake formation, double decomposition, etc., the primary or direct affinities are less clearly defined; among these are comprised the mordanting of cotton with chromium chloride and the weighting of silk by stannic chloride or tannic acid. When silk is dipped in stannic chloride solution, drained, and washed exhaustively with water, stannic hydroxide is fixed in the fibre and the process may be repeated with cumulative effect. The simple theory of mechanical impregnation followed by hydrolysis does not account for the fact that stannic chloride is withdrawn from the bath and concentrated in the silk. This absorption in the case of pure materials takes place without disturbance of the normal composition of the stannic chloride. The reaction in its full degree is specific for silk and the stannic hydroxide is uniformly distributed through the fibre. The evidence in favour of the formation of an additive chemical compound between stannic chloride and silk fibroin is not convincing; no molecular ratios have been established. Such a compound, which becomes hydrolysed in presence of water, has been prepared with α -alanine and stannic chloride but only by heating in a sealed tube at 150° C., conditions very different from those of the weighting of silk.

The author favours an electrical, so-called "ionetic" theory as offering the most rational explanation of the facts. He has observed that heavier weightings are obtained, the higher the state of electrolytic dissociation or conductivity of the stannic chloride solution, and that when at certain concentrations, the electrolytic dissociation of the stannic chloride is reduced to a minimum, the property of weighting silk is also suppressed. The silk fibre possesses in a special degree the property termed "electro-affinity" and it is suggested that the attraction of a mordant to a fibre is most highly developed when the dissociation of the mordant solution corresponds with a maximum difference between the electro-affinities of the mordant ions and of the fibre. Although in an acid medium silk readily acquires a positive charge, it is known to be highly susceptible to a reversal in sign of its electrical charge; it is therefore assumed that in a dissociated stannic chloride bath the silk becomes negatively charged. According to the degree of dissociation of the bath the tin cations are attracted to the negatively charged silk and retained by it in union with the hydroxyl ions of the aqueous medium. The chlorine anions, migrating later, are also attached to the silk in union with the hydrogen ions of the water, being removed in the form of hydrochloric acid in the subsequent washing.—J. F. B.

PATENTS.

Yarn dyeing machines; Guard for use with—. F. Crayton and W. E. Shaw, Birkenshaw. Eng. Pat. 17,761, Dec. 20, 1915.

To prevent the material to be dyed from coming into contact with the propellers, E, a toothed guard of wood, aluminium, or other acid-resisting



material, A, with end dowels, A', journaled into the sides of the vat, is fitted transversely across the upper part of the vat between the dyeing chamber and the circulating chamber; the guard rises and falls automatically according to the direction of flow of the dye-liquor and may be locked clear of the dyeing chamber during the insertion or withdrawal of the material by means of a linged drop lid, B, and side-bolt, C.—F. W. A.

Bleaching process. H. Wade, London. From Deutsche Gold- und Silber-Scheide Anstalt, vorm. Roessler, Frankfurt, Germany. Eng. Pat. 10,916, July 27, 1915.

It is not necessary to raise the temperature of an alkali peroxide bleaching bath gradually to 80° C. as suggested in Fr. Pat. 460,959 of 1913 (this J., 1914, 76); it is preferable to heat the bath

immediately to 85° C. The time of bleaching is shortened, better whites are produced, and dark Egyptian cotton may be bleached at the same cost as ordinary cotton. A stabilising catalyser, e.g., stannic acid, colophony, dextrin, or gelatin, is added to the bath; thus a suitable bath for Egyptian yarn is a 0.28% solution of sodium peroxide to which has been added 0.025% of sodium silicate, 0.02% of magnesium chloride, and 0.07% of Monopol soap. (Reference is directed, in pursuance of Sect. 7, Sub-sect. 4, of the Patents and Designs Act, 1907, to Eng. Pats. 23,110 of 1900, 14,385 of 1905, and 15,137 of 1907; this J., 1902, 48; 1906, 280; 1908, 682.)—F. W. A.

Sizing yarns; Apparatus for — W. A. Nivling, Arlington, Mass., U.S.A. Eng. Pat. 10,866, July 27, 1915.

See U.S. Pat. 1,153,245 of 1915; this J., 1915, 1050

VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Magnesium salts: Precipitation of — by ammonium carbonate. F. Fichter and R. Osterwalder. Z. anal. Chem., 1910, 55, 389—392.

WHEN magnesium sulphate solution is treated with ordinary ammonium carbonate solution (this solution reacts as a mixture of ammonium carbonate and bicarbonate), crystalline hydrated magnesium carbonate, $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$, is precipitated gradually; the precipitate forms more quickly when the mixture is warmed. If ammonia is added previously to the ammonium carbonate solution so that the proportion of ammonia to carbon dioxide corresponds with the formula $(\text{NH}_4)_2\text{CO}_3$, crystals of the hydrated magnesium carbonate appear within 30 minutes; by heating the mixture to 40° C., an amorphous precipitate of *magnesia alba* is formed which changes into the hydrated carbonate when the mixture is cooled. When the ammonium carbonate solution contains an excess of ammonia, basic magnesium carbonate (*magnesia alba*) is first formed and this changes after a few hours into the hydrated carbonate; if, however, the precipitation is made from a hot solution, the basic carbonate remains as such when the mixture is cooled. A double carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot \text{MgCO}_3 \cdot 4\text{H}_2\text{O}$, is obtained by treating, in the cold, 1 equivalent of magnesium sulphate with 10 equivalents of ammonium carbonate, $(\text{NH}_4)_2\text{CO}_3$.—W. P. S.

Sulphur: Determination of small quantities of sulphide — W. A. Drushel and C. M. Elston. Amer. J. Sci., 1916, 42, 155—158.

SULPHUR present as sulphide can be determined with great rapidity (10 mins.) and with fair accuracy by treatment with dilute acid, causing the hydrogen sulphide to impinge upon lead acetate paper, and comparing the colour produced with a series of standard tints. The latter were obtained with a simple apparatus comprising a 100 c.c. flask fitted with a cork through which passed an upright tube, 15 cm. long, and 18 mm. diam., drawn out at the base to enable it to pass through the cork. A solution of sodium sulphide in nitrite-free distilled water, and of known sulphur content, was placed in the flask together with 25 c.c. of about 0.5% hydrochloric acid: the liquid was boiled gently and the hydrogen sulphide escaping made to traverse a piece of filter paper previously soaked in lead acetate solution, which was tied over the top of the outlet tube. The excess of lead acetate was washed out of the paper, and the latter dried and labelled. In this way stains corresponding to 0.0008—0.002% of sulphide sulphur were prepared. The determination of sulphide sulphur was performed in a precisely similar

manner, but a narrower outlet tube was used when the sulphur content was less than 0.001%. The maximum error with the latter was 0.0003% and with the wider tube 0.001%. The method was tested against other approved methods and was found to be applicable to the determination of sulphur in coke and in paper, and of hydrogen sulphide in gaseous mixtures.—E. H. T.

Lead chlor-arsenate or artificial mimetite; Preparation and properties of — C. C. McDonnell and C. M. Smith. Amer. J. Sci., 1916, 42, 139—145.

A COMPOUND approximating in composition to the mineral mimetite, $\text{Pb}(\text{PbCl})(\text{AsO}_4)_2$, was obtained as a gelatinous precipitate by pouring a solution of di-lead arsenate in 40% boiling ammonium chloride solution, into cold water. It was also produced by digesting the lead salt with sodium, ammonium, or potassium chloride in aqueous solution, the action being very rapid when heat was applied. Sodium chloride in 2% or 10% solution was particularly effective in yielding a compound practically identical in composition with the mineral. The same product was obtained when solutions of the arsenate and lead chloride were warmed together. So prepared, the substance was almost entirely amorphous, but by adding lead acetate solution to the lead arsenate dissolved in dilute hydrochloric acid, until incipient precipitation occurred, and then cooling, a homogeneous crystalline mass was obtained, the crystals consisting of hexagonal prisms bounded by pyramids. Fine hexagonal crystals of practically the same composition as the mineral were obtained by adding about 30 grms. of arsenic acid to 2 litres of boiling, saturated sodium chloride solution, precipitating with lead acetate, filtering, and adding 600 c.c. of boiling water to the filtrate. The lead-chlor-arsenate separated quickly, and was washed repeatedly with boiling water until the wash water was entirely free from chloride. Its sp.gr. was 7.15 (natural mimetite 7.0—7.25); it had a slight yellow tint, and the crystals were uniaxial; the mineral is usually biaxial.—E. H. T.

Margarosanite, a new lead-calcium silicate from Franklin, N.J. W. E. Ford and W. M. Bradley. Amer. J. Sci., 1916, 42, 159—162.

ANALYSES showed that this new mineral consists essentially of a double silicate of lead and calcium together with some manganese, and the formula $\text{Pb}(\text{Ca}, \text{Mn})(\text{SiO}_3)_2$ was deduced. It is colourless and transparent, of hardness 2.5—3, sp.gr. 3.991, possessing three well-defined cleavage planes, and probably belonging to the triclinic system. It is decomposed by nitric acid with separation of silica. The name margarosanite was given to it on account of its nacreous lustre and lamellar structure (Gr. *margarites*, pearl, and *saris*, tablet or board).—E. H. T.

Uranyl-potassium oxalates. A. Colani. Comptes rend., 1916, 163, 123—125.

STUDY of the system: uranyl oxalate, normal potassium oxalate, and water at 15° and 50° C. respectively, showed that besides potassium oxalate, $\text{K}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$, and uranyl oxalate, $\text{UO}_2\text{C}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$, there exist as solid phases, $\text{K}_2(\text{UO}_2)(\text{C}_2\text{O}_4)_2 \cdot 3.5\text{H}_2\text{O}$ at 15° C., $\text{K}_2(\text{UO}_2)(\text{C}_2\text{O}_4)_2$ at 50° C., and $\text{K}_2(\text{UO}_2)_2(\text{C}_2\text{O}_4)_3 \cdot 4\text{H}_2\text{O}$ and $\text{K}_4(\text{UO}_2)_2(\text{C}_2\text{O}_4)_3 \cdot 10\text{H}_2\text{O}$ at both temperatures. The compounds appear to be of the nature of double salts, for even in presence of a large excess of potassium oxalate, they give the customary reactions of uranyl salts.—A. S.

Rare earth cobaltcyanides. C. James and P. S. Willand. J. Amer. Chem. Soc., 1916, 38, 1497—1500.

THE rare earth cobaltcyanides have the general

formula $R_2(\text{CoC}_2\text{N}_4)_3 \cdot 9\text{H}_2\text{O}$. They form heavy microcrystalline precipitates, sparingly soluble in water, and varying in solubility in dilute hydrochloric acid (sp.gr. 1.050) from 10.75 and 10.41 parts per 1000 in the case of cerium and lanthanum to 2.78 parts with yttrium and 0.33 part with ytterbium. Since the yttrium salt is more than three times as soluble as the erbium salt, the cobalticyanide method is excellent for their separation. A separation of oxides containing dysprosium, holmium, and yttrium with traces of erbium, terbium, and neodymium was also effected, the yttrium appearing in the more soluble and the dysprosium and holmium in the less soluble fractions.—G. F. M.

Conductivity of pure water; The specific — in equilibrium with atmospheric carbon dioxide. J. Kendall. J. Amer. Chem. Soc., 1916, 38, 1480—1497.

By calculation from the ionisation constant of carbonic acid, the mobility of the HCO_3^- ion, the carbon dioxide content of the atmosphere, and the solubility of carbon dioxide in water under atmospheric conditions, the values 0.65×10^{-6} , 0.75×10^{-6} , and 0.80×10^{-6} were obtained for the temperatures 0° , 18° , and 25°C . respectively for the specific conductivity of pure water in equilibrium with carbon dioxide, figures which agree closely with those obtained by direct measurement of the conductivity of carefully purified water in contact with air. The conclusion is accordingly drawn that purified conductivity water really consists of a saturated solution of carbonic acid under the partial pressure of the carbon dioxide in the atmosphere, and contains no other conducting impurities in any appreciable quantity.—G. F. M.

Selensulphur from Hawaii; Composition of the —. G. V. Brown. Amer. J. Sci., 1916, 42, 132—134.

THE specimen examined, obtained from the United States National Museum, was a piece of slag-like lava, resembling pumice in appearance, and impregnated with an orange-red to yellow crystalline mineral. After crushing coarsely, the yellow to orange mineral portion was picked out by hand, and its selenium content determined by the method of W. Smith (this J., 1915, 1090). It contained 0.68% of selenium, 12.44% of sulphur, and 3.16% of matter volatile at 103°C . (moisture). Deducting material other than sulphur and selenium, the percentage composition of the mineral was calculated to be: sulphur 94.82%, selenium 5.18%. The very low proportion of selenium to sulphur (1:45.5) indicated that the mineral should be regarded as a "seleniferous sulphur" rather than as selensulphur, a mineralogical term used to connote a naturally occurring isomorphous mixture of the two elements.—E. H. T.

Trisulphur dichloride; Existence of —. M. M. Richter. Ber., 1916, 49, 1024.

MICHAELIS (Ber., 1890, 23, 553) has shown that thionyl chloride acts under certain conditions as a mixture of sulphur dichloride and sulphuryl chloride: $2\text{SOCl}_2 = \text{SCl}_2 + \text{SO}_2\text{Cl}_2$. Sulphur chloride reacts with *p*-chlorophenol as a mixture of sulphur dichloride and trisulphur dichloride: $2\text{S}_2\text{Cl}_2 = \text{SCl}_2 + \text{S}_3\text{Cl}_2$, yielding a practically equimolecular mixture of 5,5'-dichloro-2,2'-dihydroxydiphenyl monosulphide (m.pt. 174°C .) and trisulphide (m.pt. 133°C .). The yield of trisulphide is increased by addition of sulphur to the sulphur chloride, as this converts any dichloride into monochloride which can then form trisulphur dichloride.—F. W. A.

Hydrogen; Production of — from formates and from carbon monoxide [and bases]. M. G. Levi and A. Piva. Annali Chim. Appl., 1916, 5, 271—301. (See this J., 1914, 310.)

CALCIUM formate in an atmosphere of nitrogen begins to decompose at about 375°C ., and barium formate at about 350°C .; in both cases the residue is free from oxalate and consists almost entirely of carbonate (compare Vignon, this J., 1911, 121). In presence of calcium hydroxide the temperature of decomposition of calcium formate is lowered; the gaseous decomposition products contain less carbon monoxide and more hydrogen, and in presence of sufficient lime, carbon dioxide and methane disappear from the gas. With quicklime instead of slaked lime, less gas is produced and this contains some carbon dioxide and methane, whilst the solid residue is dark-coloured owing to the presence of carbonaceous matter. A mixture of sodium formate and calcium hydroxide yields nearly pure hydrogen. Interaction of calcium hydroxide and carbon monoxide begins at about 300°C . with dry carbon monoxide and at 250° — 280°C . with moist carbon monoxide. The yield of hydrogen increases with the temperature, reaching 90% at 400°C . and 99% at higher temperatures. Low velocity of carbon monoxide and great surface of contact between the gas and lime are favourable to the yield of hydrogen. The gas contains only carbon monoxide in addition to hydrogen, except for traces of methane, etc. (compare Vignon, *loc. cit.*). The solid residue contains formate when the reaction temperature does not exceed 400°C ., but not when a temperature of 500° — 700°C . is used. In presence of steam, carbon monoxide interacts with calcium hydroxide to form formate at 250° — 300°C ., and carbonate and hydrogen above 300°C ., but the reaction is much slower than with sodium hydroxide. At 500° — 600°C ., however, the formation of hydrogen is almost quantitative provided the elements of water are always present. In presence of sodium hydroxide, even in small quantity, lime reacts at a considerably lower temperature, and it is possible to obtain a yield of 50% of hydrogen even at 300°C .—A. S.

Red prussiate for blue print paper. See XXI.

Hygroscopic properties of sodium, potassium, and ammonium nitrates, potassium chloride, and mercury fulminate. Taylor and Cope. See XXII.

Use of ferric oxide as standard in the volumetric determination of iron in hydrochloric acid solution. Brandt. See XXIII.

PATENTS.

Lime; Apparatus for burning — [using lignite as fuel]. P. A. and E. J. Walsh, Round Rock, Tex. U.S. Pat. 1,191,752, July 18, 1916. Date of appl., Nov. 18, 1914.

LIGNITE is burnt in a side combustion chamber, provided with a grate having bars spaced apart to permit burning particles to fall through. An air-distributing chamber, with front and rear walls converging in a downward direction, is located below the grate, the inner surfaces of the walls being smooth to prevent the accumulation of burning particles. An ash-pit, with a constricted air inlet, is located below, and is connected to the lower end of the distributing chamber by an inclined air shaft, equal in width to that of the grate but of less depth. The front and rear walls of the distributing chamber have a greater inclination to the vertical than the front and rear walls of the air shaft. Particles of lignite falling from the rear portion of the grate are conveyed by the rear wall of the chamber on to the rear wall of the air shaft, but from the front portion of the

grate the particles are caused by the front wall of the chamber to fall the entire length of the air shaft. The particles of lignite, which are only partially consumed in the grate, are thus burnt in the air shaft or the ash-pit, producing a long flame in the lime kiln.—B. N.

Ammonium phosphate; Manufacture of — H. Hilbert, Neuss. Ger. Pat. 292,530, Apr. 10, 1914.

PHOSPHORIC acid is added continuously to a solution containing di-ammonium phosphate, in such proportion that a slight excess of the latter is always present, whereby primary ammonium phosphate is precipitated and can be removed continuously.—A. S.

Scandium; Direct separation of — from other rare earths. M. Speter, Charlottenburg. Ger. Pats. (A) 282,857, Nov. 17, 1911, and (B) 292,257, Jan. 24, 1912.

(A) THE mineral is decomposed with sulphuric acid, hydrochloric acid, or the like, or first fused with alkali and then treated with acid. The acid solution is heated to boiling and treated with hypophosphoric acid or a hypophosphate. Under these conditions scandium, unlike other trivalent rare earths, forms an insoluble compound. The precipitate is separated, decomposed by sulphuric acid, and the scandium precipitated from the solution as oxalate, which is further purified by known methods. (B) Pyrophosphoric acid or metaphosphoric acid or their salts, or mixtures of them, are used instead of hypophosphoric acid to precipitate the scandium. The precipitate contains other rare earths in addition to scandium, but is easily purified.—A. S.

Graphite; Expanded — J. W. Aylsworth, East Orange, N.J., Assignor to Condensite Co. of America, Bloomfield, N.J. U.S. Pat. 1,191,383, July 18, 1916. Date of appl., Dec. 4, 1914.

PARTICLES of flake graphite, too large to pass through a 200-mesh screen, are covered with an oxidising agent, so as to form graphitic acid as films on the laminae of the individual flakes. Heat is applied to dissociate the acid, and the particles become distended, like the leaves of an open book, with mechanically-entrapped gas between the laminae. The mass is afterwards heated to redness.—B. N.

Carbon articles; Process of making — A. T. Hinckley, Niagara Falls, N.Y., Assignor to National Carbon Co., Cleveland, Ohio. U.S. Pat. 1,192,062, July 25, 1916. Date of appl., Oct. 11, 1912.

AMMONIUM sulphate is mixed with coke and pitch to substantially 5 to 15% of the pitch content, and the mixture heated, formed into articles, and then baked to set the binder.—B. N.

Hydrogen from iron and steam; Shaft-furnace for production of — A. Messerschmitt, Stolberg. Ger. Pat. 291,902, Feb. 12, 1914.

THE annular reaction chamber is divided into sections by vertical projections from the walls or by partitions.—A. S.

Sulphides of phosphorus; Manufacture of — F. C. Frary, Minneapolis, Minn., U.S.A. Eng. Pat. 14,962, Oct. 22, 1915. Under Int. Conv., Feb. 3, 1915.

SEE U.S. Pat. 1,153,054 of 1915; this J., 1915, 1054.

Chromates of lead; Process of preparing — International Color and Chemical Co., Inc., Assignees of A. S. Ramage, Detroit, Mich., U.S.A. Eng. Pat. 100,300, Mar. 2, 1916. Under Int. Conv., Apr. 16, 1915. (Appl. No. 3175 of 1916.)

SEE U.S. Pat. 1,168,417 of 1916; this J., 1916, 309.

Calcium cyanamide; Rotary tube furnace for producing continuously — J. H. Lidholm, London. U.S. Pat. 1,191,804, July 18, 1916. Date of appl., Feb. 14, 1914.

SEE Eng. Pat. 3546 of 1914; this J., 1914, 644.

Neon; Method for separating — from gases with which it is mixed. G. Claude, Paris. U.S. Pat. 1,191,495, July 18, 1916. Date of appl., June 17, 1913.

SEE Fr. Pat. 456,694 of 1912; this J., 1913, 1068.

Utilising the waste products of garnet works. U.S. Pat. 1,192,894. See X.

VIII.—GLASS; CERAMICS.

Water-glass glazes. Berge. Sprechsaal, 1916, 49, 2—3, 9—10, 17—18. Z. angew. Chem., 1916, 29, Ref., 342.

LEADLESS red glazes for ordinary earthenware fired at Seger cone 08—010, can be prepared by the use of soda water-glass and behave like leadless frit-glazes in regard to crazing, and action on colouring oxides or underglaze colours. The chief technical difficulty lies in the fact that the glaze mass after mixing with water is soon spoiled owing to the separation of gelatinous silicic acid by the action of atmospheric carbon dioxide. This separation can be retarded by addition of calcium carbonate, but not entirely prevented, as the quantity of lime required would diminish the fusibility of the glaze too much. Like leadless frit-glazes, water-glass glazes must be fired in a slightly reducing atmosphere; they give results at least equal to those obtained with lead glazes.—A. S.

PATENTS.

Glass; Composition of — E. Weintraub, Lynn, Mass., Assignor to General Electric Co., New York. U.S. Pat. 1,191,630, July 18, 1916. Date of appl., May 8, 1912.

SEE Eng. Pat. 18,300 of 1912; this J., 1913, 1157. The magnesium borosilicate glass has a thermal coefficient of expansion less than 3.5×10^{-6} .

Glass batch or mixture. E. L. Elliott, New York, Assignor to Macbeth-Evans Glass Co., Pittsburgh, Pa. U.S. Pat. 1,192,018, July 25, 1916. Date of appl., July 17, 1914.

A FOUNDATION of colourless glass is combined with an excess of a sulphate which will not affect or be affected by any silica or alkalis in the mixture, and with aluminium and fluorine compounds in such proportions that the elements aluminium and fluorine are present in equal quantities by weight.—A. B. S.

Glass. W. C. Taylor, Assignor to Corning Glass Works, Corning, N.Y. U.S. Pat. 1,192,474, July 25, 1916. Date of appl., Sept. 17, 1914. Renewed Dec. 27, 1915.

A GLASS containing silica, boric oxide, and lithi (with or without alumina) in proportions to produce a coefficient of expansion less than 0.000036.—A. B. S.

Kiln. C. Carstens, Grossflottbek. Ger. Pat. 292,140, Mar. 5, 1912.

A KILN for burning ceramic ware, etc., consists of a series of movable wagon-chambers, which run on two parallel sets of rails, the two rows being connected at the ends by U-shaped chambers running on transverse rails.—A. S.

[Glass] annealing furnaces or lehrs. L. Steelman, Millville, N.J., U.S.A. Eng. Pat. 100,899, Feb. 8, 1916. (Appl. No. 1882 of 1916.)
SEE U.S. Pats. 1,178,549 and 1,178,550 of 1916; this J., 1916, 635.

Artificial stone for flooring material, paving, stone-ware, etc. Ger. Pat. 292,645. See IX.

IX.—BUILDING MATERIALS.

Iron-Portland cement; Examination of—after hardening in air and under water. M. Gary. Mitt. K. Materialprüf., 1915, 33, 271—290.

PERMISSION was granted on March 6, 1909, by the German Minister for Public Works for the use of iron-Portland cement in place of Portland cement if, in addition to complying with the prescribed requirements for Portland cement (see this J., 1910, 1107), it gives satisfactory results after hardening in air. Tests have now been made with representative samples of iron-Portland cement, using mixtures of the cement with Freienwald sand in the proportions 1:2, 1:5, and 1:7 by weight and by volume respectively, in addition to tests with the customary mixture with standard sand in the proportion of 1:3 parts by weight. In the case of the mixtures with Freienwald sand, one set of test-pieces was hardened for 1 day in air and then up to 90 days under water, and another set for the whole period in air, but covered with wet sacks from the second to the seventh day. The results show that in both cases the strength increases uniformly with the time, and that the curves for the air-hardened and water-hardened test-pieces are practically parallel. With the 1:5 and 1:7 mixtures, the air-hardened test-pieces were stronger than those kept under water, whereas with the 1:2 mixture, the water-hardened samples were stronger than those kept in air from about the fourteenth day onwards. In consequence of these results it has been decided by the German Minister for Public Works that special air-hardening tests are no longer necessary for iron-Portland cement and that this product may be substituted as desired for Portland cement.—A. S.

PATENTS.

Firebricks (lime-sand bricks) and method of making same. S. H. Nordin, Tacoma, Wash. U.S. Pat. 1,192,099, July 25, 1916. Date of appl., Aug. 7, 1914.

QUARTZ and limestone are separately calcined at 1500° C., and the quartz is ground so that one-third consists of particles 1.5—2 mm. diameter, and the remainder of smaller particles. The quartz is mixed with 6% of the ground lime, and the mixture is made into a paste with about 6% water, moulded, and hardened by steam under high pressure.—A. B. S.

Lime mortar; Manufacture of— W. Olschewsky, Coswig. Ger. Pat. 292,561, Aug. 13, 1914.

PAPER pulp, in a very fine state of division, is intimately mixed with the slaked lime.—A. S.

Artificial stone for flooring material, paving, stone-ware, etc. Radeburger Ton- u. Chamottewerke F. L. Strack und Co., Rabenburg. Ger. Pat. 292,645, Apr. 25, 1914.

GROUND syenite is mixed with syenite-containing clay which has been dried and ground, and the mass is mixed with a small quantity of water and moulded and fired in the usual manner.—A. S.

X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Passivity of iron. A. Smits. De Ingenieur, 1915, 357—359. Chem.-Zeit., 1916, 40, Rep., 225—226.

A THEORY of the passivity of iron is developed, based on the assumption that in addition to uncharged atoms and free electrons, the metal contains two different kinds of ions of different valency, viz., α ("base") ions and β ("noble") ions. These two kinds of ions are in equilibrium and the production of the passive state is to be ascribed to destruction of this equilibrium. In the anodic solution of a metal, polarisation occurs because the metal tends to dissolve more rapidly than the equilibrium mentioned is established, so that a concentration of "noble" ions takes place at the surface of the metal. Ordinary iron always contains hydrogen, and it is known that hydrogen ions, like halogen ions, greatly accelerate the change from the passive to the active state, i.e., they catalytically accelerate the establishment of equilibrium between the two kinds of ions. In the anodic solution of iron, a portion of the hydrogen also dissolves, and as the concentration of hydrogen in the iron thus falls, so the tendency for the equilibrium to be disturbed increases. By increasing the current density so that the potential rises to the value corresponding to the anodic evolution of oxygen, hydrogen is removed completely from the surface of the iron, and the disturbance of the equilibrium (production of passive state) reaches a maximum. This condition persists for a short time when the current is cut off, but hydrogen soon diffuses from the interior to the surface of the iron, where it catalytically accelerates the re-establishment of equilibrium, and hence of the active state. When iron is immersed in strong nitric acid, the α ("base") ions dissolve with great rapidity and hydrogen ions are also removed from the surface of the metal, so that the passive condition is established. In ferrous chloride solution, on the other hand, passivity is not produced, because both the chlorine ions and the halogen ions catalytically accelerate the change from the passive to the active condition. Active iron in dissolving sends ferrous ions almost exclusively into solution, and it would be anticipated from the usual formula for expressing the single potential, that the potential would be more strongly negative in a ferric than in a ferrous solution. Actually the reverse is the case, and the following explanation is suggested. Since iron sends ferrous ions almost exclusively into solution, the solution with which iron is in electromotive equilibrium must likewise contain ferrous ions almost exclusively. When immersed in ferric sulphate solution, iron tends to alter the composition of the solution so as to make it approach that of a solution in electromotive equilibrium with the metal, i.e., the iron sends ferrous ions into the solution with a velocity greater than that with which ionic equilibrium in the iron is established; hence there is a concentration of ferric ions at the surface of the iron, and the potential becomes more positive.—A. S.

Mild steel; Tests with cold-drawn and reheated— O. Bauer. Mitt. K. Materialprüf., 1915, 33, 395—407.

THE tests were made with pieces cut from a rod of mild steel which had been cold drawn in one operation from 41.5 mm. to 39 mm. diameter. The steel contained: C 0.29, Si 0.08, Mn 0.98, P 0.031, S 0.048, Cu 0.06, and Cr 0.015%. One piece was tested in its original (cold-drawn) condition and ten others were heated respectively, in an oil bath to 100°, 200°, and 300° C., and in a Heraeus electric furnace to 400°, 450°, 500°, 550°, 600°, 700°, and 900° C.; the piece heated at 900° C.

(for $\frac{1}{2}$ hour) was cooled in the air, whilst the others, after heating for 2 hours at the temperatures mentioned, were cooled more slowly in the oil bath or in the furnace. The hardness, determined by the ball method, began to diminish distinctly when the reheating temperature reached 400° C., fell to a minimum value after heating at 700° C., and then increased again slightly. The corrosion by 1% sulphuric acid diminished continuously as the reheating temperature was increased; this affords a better means of detecting whether a steel has been reheated than does a determination of the hardness. No relation could be traced between the degree of corrosion in a 1% solution of sodium chloride and the reheating temperature. The resistance to impact diminished after heating at the lower temperatures, then began to increase again, until after heating at 450° C. nearly the same value was obtained as for the cold-drawn metal; above 500° C. the resistance to impact increased greatly as the temperature of reheating was augmented. The tensile strength and limit of elasticity fell and the elongation increased as the temperature of reheating was increased above 400° C.; test-pieces from near the edge of the rod gave higher values for the limit of elasticity than test-pieces from the centre.—A. S.

Steel; Alumina inclusions in —. A. Sauveur. *Met. and Chem. Eng.*, 1916, 15, 149—151.

From micrographic examination of specimens comprising ingot steel to which aluminium had been added during teeming, thermit iron produced with an excess of aluminium, ingot iron melted with aluminium, and ingot iron melted with alumina, it is concluded that alumina inclusions may be distinguished from others commonly present in steel by their small size, dark colour, and more especially by a complete absence in them of elongation in the direction of rolling or forging.—W. E. F. P.

Flotation of oxidised ores. O. C. Ralston and G. L. Allen. *Min. and Eng. World*, 1916, 45, 137—140.

Flotation of oxidised ores is preceded in all cases by more or less thorough sulphidising, which may be accomplished by (1) hydrogen sulphide acting on the crushed, dry or wet, ore, (2) sulphides of sodium or calcium, (3) sulphur vapour, (4) oils containing loosely combined sulphur, or (5) colloidal sulphur. *Lead carbonate ores*. When the dry ore was treated with hydrogen sulphide, satisfactory extraction by flotation could not be obtained until the particles had been sulphidised to the core. Treatment of the wet pulp, however, resulted in the formation of a film of sulphide after a short time, and extraction was satisfactory; hence the wet method is more economical. Sodium sulphhydrate gave the best results with this class of ore, the normal sulphide being slightly less effective; 10—20 lb. is required per ton of ore, with a pulp ratio of 1:1. Calcium polysulphide was more sluggish in its action. The other three sulphidising agents gave poor results. Some of the ores tested showed an extraction of 73—83% of the lead and 48—80% of the silver. A plant for the treatment of tailing dumps is being erected at Pioche, Nev. *Oxidised copper ores*. Hydrogen sulphide applied to the wet pulp seems to be the best sulphidising agent, and is in use at Magma, Ariz. *Oxidised zinc ores* have not yet been treated successfully by any of the above methods.

—W. R. S.

Joplin (zinc blende) tailing; Flotation experiments on —. W. A. Whitaker, G. Belchic, R. Neal, and H. L. van Velzer. *Met. and Chem. Eng.*, 1916, 15, 131—137.

THE tailing used, about 4% of which was retained

on a 200-mesh sieve, was much finer than the average material for the district and contained Zn 3.60, Pb 0.31, Fe 0.53 (all as sulphides), and "insoluble" 91.72%. Mixtures of tailing (400 grms.) with water (2000 grms.) and varying amounts of oil were agitated in a laboratory machine of the Lyster or Hoover type, after which the froth removed by skimming and overflow was dried, weighed, and assayed for zinc. Tests were made at 20° and 70° C. in neutral, acid, and alkaline solutions and with 28 different oils comprising drying, semi-drying, and non-drying vegetable oils, animal oils, petroleum oils, and products from the distillation of wood and coal. From the results it is concluded that the tailing in question is readily amenable to successful flotation under many simple and economical conditions. Generally speaking, vegetable oils and the lighter wood distillates exerted a good selective action on blende in neutral and acid pulps and yielded rich concentrates; whereas phenolic and creosotic oils were less selective towards blende although yielding high total extractions. The richest concentrates and highest extractions were obtained in the more highly acid pulps. Probably a mixture of "concentrating" and "extracting" oils (the terms being used in the preceding sense) would give the most effective results.

—W. E. F. P.

Tungsten-molybdenum ores; Concentration of —. A. J. Robertson. *Bull. 64, Geol. Survey of W. Australia. Eng. and Min. J.*, 1916, 102, 126—127.

AN ore from the Murchison Goldfields containing molybdenite 2, scheelite 10, wolframite $1\frac{1}{2}$, and gangue 86 $\frac{1}{2}$ %, was treated in the laboratory by flotation to recover the molybdenite, then by gravity concentration to obtain the tungsten minerals. It was found that crushing to 80-mesh caused sliming of the clayey gangue, the fine dust coating the molybdenite and preventing flotation. Better results were obtained with ore crushed to pass a 30-mesh screen, but it was not possible to obtain high-grade molybdenite by a single treatment. The best results were obtained by floating carefully sized material (30—40 mesh), screening the float through a 90-mesh screen, and rejecting the undersize consisting mostly of gangue. The tungsten minerals were satisfactorily extracted from the 30-mesh flotation tailings by panning.—W. R. S.

Agglomerates; Manufacture and properties of globular —. C. A. Brackelsberg. *Z. angew. Chem.*, 1916, 29, 281—285.

THE agglomerates are produced in a plant consisting of a mixer, an agglomerating drum, and a dryer (see Ger. Pat. 287,606; this J., 1916, 243); they may be made from almost any powder and any solution which crystallises out or leaves a crusty residue upon evaporation. The finished product consists of balls that resist crushing, yield very little powder on breaking, and possess a high degree of porosity due to evaporation of the liquid. Hence the action of gases, such as occurs in roasting and smelting, is much more rapid and thorough than on briquettes or sintered products. Copper, lead, bismuth, antimony, gold, silver, and zinc may be volatilised by the action of hydrochloric acid gas on agglomerates containing them, and thus be separated from iron, manganese, and nickel.—W. R. S.

Preparation and properties of lead chlor-arsenate. McDonnell and Smith. See VII.

Margarosanite, a new lead-calcium silicate from Franklin, N.J. Ford and Bradley. See VII.

Use of ferric oxide as standard in the volumetric determination of iron in hydrochloric acid solution. Brandt. See XXIII.

PATENTS.

Steel; Process of tempering or hardening — J. B. Moore, Latrobe, Pa. U.S. Pat. 1,190,937, July 11, 1916. Date of appl., Feb. 24, 1915.

To harden high-speed steel, the surface of the metal is cleaned, wetted with water, the wet surface covered with boric acid, and the metal heated first until the boric acid is converted into a glaze and subsequently to a white heat, and then quenched. After the first coating of boric acid has been melted, a second coating may be applied and likewise melted, before heating the metal to a white heat.—A. S.

Ores; Separation of — [by flotation]. H. V. Seale and W. Shellshear, Broken Hill, N.S.W. Eng. Pat. 10,666, July 22, 1915. Under Int. Conv., July 30, 1914.

In an agitation-froth process, the ore pulp is delivered into the open top of a pipe which extends from the bottom of the feed box to beneath the surface of the liquid in the separating-box, aeration of the charge being effected, without mechanical agitation, by air entrapped by the pulp flowing through the pipe. The separating-box is provided with a baffle below the feed-pipe, a peripheral overflow for concentrate, and an adjustable discharge opening at the bottom for residues. In practice a number of separating- and feed-boxes are arranged in series, one above the other alternately, the residues from the uppermost separating-box passing to the next feed-box below, and so on.—W. E. F. P.

Concentrating metallic ores by flotation; Process of — H. T. Yaryan, Toledo, Ohio. U.S. Pat. 1,191,053, July 11, 1916. Date of appl., Mar. 29, 1916.

The comminuted ore is agitated in water to which is added a mixture of 65% of oil and 35% of sodium resinate, petroleum constituting upwards of 50% of the mixture, and the froth formed, carrying the metallic particles, is recovered by flotation.—A. S.

Tin on iron and other metallic surfaces; Process for electrolytically depositing — P. Marino, London. Eng. Pat. 11,011, July 29, 1915.

The electrolyte is prepared by dissolving the chloride, citrate, or tartrate of tin in hydrochloric acid, then adding phosphoric acid and a solution of a salt of an alkali metal, such as potassium bitartrate, sodium pyrophosphate, or ammonium chloride.—W. R. S.

Metal sheets, bars, rods, wire, castings and the like, and of articles made therefrom; Treatment or preservation of the surfaces of — F. and T. Williams, Warrington. Eng. Pat. 11,917, Aug. 18, 1915.

AFTER being slightly heated, the metal is successively coated with a mixture of red-lead, linseed oil, and gold size, allowed to "dry," until the coating becomes "tacky," and rubbed or pressed with powdered graphite or such other substances as will give hardness to the coating, e.g., graphite mixed with one or more of the following: red-lead, aluminium, pumice, whiting, or ferric oxide.

—W. E. F. P.

Aluminium or alloys thereof; Solder for the jointing of — J. B. Solloway, Willesden, Middlesex. Eng. Pat. 13,109, Sept. 14, 1915.

The solder is composed of aluminium, 0.75; tin, 16; zinc, 5; zinc phosphate, 0.0078; bismuth, 0.0078; and ammonium chloride, 0.0156

parts. For large work, the proportions of aluminium and zinc are increased to 1 and 6.25 parts respectively; for light work, the aluminium is omitted and the zinc reduced to 3.5 parts.

—W. E. F. P.

Furnace for melting metal for brass castings and the like. C. F. Price, Birmingham. Eng. Pat. 100,849, Jan. 8, 1916. (Appl. No. 215 of 1916.)

THE furnace consists of a combined combustion and work-heating chamber arranged immediately above a gas-producing chamber, the latter being jacketed on two sides by flues for preheating the air for combustion and having a series of nostril apertures in the roof for effecting admixture of the producer gas and preheated air. The combustion chamber is divided into a number of compartments, or crucible chambers, any of which may be heated and operated independently; the waste gases are conducted downwards through flues which form jackets to the air channels.—W. E. F. P.

Metal-pickling and method of pickling. L. C. Drefahl, Assignor to The Grasselli Chemical Co., Cleveland, Ohio. U.S. Pat. 1,191,291, July 18, 1916. Date of appl., Feb. 19, 1916.

An acid pickling bath is mixed with approximately 6% of cellulose pulp waste, so as to form a thick foam on the solution.—B. N.

Coating wire with metal; Process of — G. L. Meaker, Joliet, Ill. U.S. Pat. 1,191,526, July 18, 1916. Date of appl., June 27, 1913.

A BATH of metal, such as spelter, is supported in contact with a bath of a heavier non-adherent metal, such as lead, the latter being kept at an annealing temperature. The article is first passed through the lead to anneal it, then through the surface of contact between the two baths, and finally through the coating bath which is maintained at a materially lower temperature than the annealing bath.—B. N.

Silver; Sterling — E. D. Gleason, Assignor to R. H. King, Brooklyn, N.Y. U.S. Pat. 1,191,890, July 18, 1916. Date of appl., Aug. 24, 1911. Renewed Oct. 9, 1915.

THE metal contains 92.5% of pure silver, alloyed with cadmium.—B. N.

Articles [alloys] subjected to high temperatures. J. C. Henderson, Washington, D.C., Assignor to Driver-Harris Wire Co., Harrison, N.J. U.S. Pat. 1,190,652, July 11, 1916. Date of appl., Jan. 4, 1916.

CAST articles subjected to high temperatures in use are made of an iron alloy, practically free from carbon, containing from 5 to 30%, preferably about 12%, of chromium, and from 50 to 90%, preferably about 60%, of another metal of the iron group having nearly the same atomic weight as iron, e.g., nickel; the chromium and the third metal together should amount to at least 60% of the alloy.—A. S.

Volatilising metals; Process of — S. I. Clawson, Salt Lake City, Utah. U.S. Pat. 1,192,037, July 25, 1916. Date of appl., Oct. 28, 1912.

POWDERED ore is subjected to an oxidising roast in presence of an excess of sulphur so as to form sulphates. A halogen salt is then added and the ore heated and rabbled with slight admission of air, to form volatile halogen compounds, which are collected in a suitable receiver.—W. R. S.

Garnet-works; Utilising the waste-products of — J. Davenport, Brighton, Mass. U.S. Pat. 1,192,394, July 25, 1916. Date of appl., Jan. 27, 1915.

GARNET dust is mixed with sufficient carbon

powder to reduce the constituents other than alumina, and enough silica to form ferrosilicon with the iron in the mineral. The mixture is heated electrically to the fusion-point of alumina until reduction is complete. The temperature is then gradually decreased to allow the alumina to crystallise and the ferrosilicon to collect in nodules.
—W. R. S.

Alkali metals; [Electrolytic] process of producing — H. Lahhardt, Mannheim, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,191,799, July 18, 1916. Date of appl., Dec. 14, 1914.

SEE Eng. Pat. 17,763 of 1914; this J., 1915, 967.

XI.—ELECTRO-CHEMISTRY.

Asbestos; Improvement of the insulating properties of — T. Schopper, Gummi-Zeit., 1915, 29, 1197; 30, 243. Chem.-Zeit., 1916, 40, Rep., 239, 279.

COMMERCIAL asbestos contaminated with iron compounds may be purified by treatment with a 2% aqueous solution of oxalic acid for 48 hours, followed by washing with water; the strength of the asbestos is not affected. A band of asbestos, 20 mm. wide, showed at 14 different places an electrical resistance of 600–700 ohms; after treatment as described, the resistance increased to 1,500,000 ohms. An alternative method consists in heating the asbestos for 20–24 hours in a current of hydrogen or carbon monoxide at 390°–400° C., and then washing with very dilute hydrochloric or sulphuric acid and afterwards with water.—A. S.

PATENTS.

Electrolytic apparatus. Siemens und Halske A.-G., Berlin. Eng. Pat. 100,739, June 8, 1916. Under Int. Conv., June 24, 1915. (Appl. No. 8111 of 1916.)

THE wires forming the electrodes are connected with and are hung freely from the same conductor, and are weighted at their lower ends with a single piece, or with individual spherical, cylindrical, or other weighting pieces; or the wires may be weighted at both ends and hung over the conductor or an insulator.—B. N.

Electrolytic cell. J. M. Goldman, St. Louis, Mo. U.S. Pat. 1,191,300, July 18, 1916. Date of appl., Oct. 4, 1915.

ELECTRODES, of opposite polarity, are arranged alternately, one above the other, at distances apart which become gradually greater towards the top of the cell, whilst the relative superficial area of each electrode lengthwise, becomes smaller.
—B. N.

Furnace; Electric — S. H. Fleming, Assignor to National Carbon Co., Cleveland, Ohio. U.S. Pat. 1,192,050, July 25, 1916. Date of appl., Jan. 7, 1914.

THE cover of the furnace is provided with a central opening for a vertical electrode, and with feed openings for the charge surrounding the electrode. The interior of the furnace is divided into an upper and lower chamber by a transverse partition with sloping surfaces which support the charge. The partition is provided with a number of openings near the walls of the furnace, to permit the passage of the charge downwards and the gaseous products upwards. It is provided also with a central opening for the electrode in line with the one in the cover, and by means of a second electrode co-operating with the first, the material is heated in the lower chamber and finally withdrawn at the bottom. Air, preheated in a surrounding channel, is admitted

to the upper chamber to burn the gaseous products, and the waste gas withdrawn from the top.—B. N.

Galvanic batteries; Regenerating the waste products of — W. Hickmann, Assignor to Chem. Fabr. Griesheim-Elektron, Frankfurt, Germany. U.S. Pat. 1,102,061, July 25, 1916. Date of appl., May 10, 1911.

THE spent electrolyte and depolarising mass of a galvanic cell of the Leclanché type, is regenerated by separating the electrolyte components from the whole mass by lixiviation with dilute hydrochloric acid. The remaining portion is treated with dilute acid, and the manganese salt thus obtained in solution is oxidised with permanganate.—B. N.

Electrolytic cells; Replenishing — W. S. Smith, Grosse Ile, Mich., Assignor to Pennsylvania Salt Manufacturing Co., Philadelphia. U.S. Pat. 1,191,356, July 18, 1916. Date of appl., June 3, 1915.

SEE Eng. Pat. 15,761 of 1915; this J., 1916, 608.

Electrolytic processes; Apparatus for use in and in connection with — A. E. Battle, London. U.S. Pat. 1,191,386, July 18, 1916. Date of appl., May 24, 1915.

SEE Eng. Pat. 14,513 of 1914; this J., 1915, 910.

Process of making carbon articles. U.S. Pat. 1,102,062. See VII.

Process for organic synthesis. [Preparation of tartaric acid.] U.S. Pat. 1,190,845. See XX.

XII.—FATS; OILS; WAXES.

Oil from the kernels of stone-fruits; Process of obtaining — K. Alpers. Chem.-Zeit., 1916, 40, 645–646.

THE cracked stones of fruits such as cherries, plums, apricots, etc., are treated with a solution of chloride of calcium or magnesium of about 1.15 sp.gr. The shells sink to the bottom, and the kernels are skimmed off the surface of the liquid, washed, dried, and the oil expressed. Only traces of hydrocyanic acid can be formed by cyanogenetic enzymes, since amygdalin is only sparingly soluble in such salt solutions; but to prevent risk it is advisable to renew the solution frequently. Oil thus prepared from plum-stone kernels had the taste and odour of bitter almonds, but it was rendered nearly odourless by exposure to a current of steam. The same effect was also obtained by heating the oil to 160° C., or by exposing it to the air for 14 days. The distillate from the treatment of 100 grms. of oil with steam contained 4 mgrms. of hydrocyanic acid.—C. A. M.

Canadian vine (Parthenocissus quinquefolia, Planchon); Oil of the fruit of the — S. Fachini and G. Dorta. Annali Chim. Appl., 1916, 5, 301–304.

THE fruits of the *Parthenocissus quinquefolia*, Planchon (*Ampelopsis quinquefolia*, Torrey and Gray) are composed of 10% of skins, 64.8% of pulp, and 25.2% of seeds. The seeds contain 11.8% of a dark yellowish-green oil (a), liquid at the ordinary temperature, and the pulp, including skins, contains 3.3% of an olive-green oil (b), of the consistence of butter: sp.gr. at 15° C., (a) 0.9215; n_D^{20} =(a) 1.4778, (b) 1.4722; saponif. value, (a) 189.2–189.6, (b) 192.3–193.3; iodine value, (a) 141.4–141.6, (b) 90.3; non-volatile fatty acids, (a) 93.97%, (b) 94%; unsaponifiable matter, (a) 1.44%, (b) 1.67%; iodine value of mixed fatty acids, (a) 144.6, (b) 94.4–94.6; mean mol. wt. of fatty acids, (a) 281.2, (b) 278.8; iodine value of liquid acids, (a) 145.8–149.2, (b) 110.2. In both cases the solid acids (a about

8%, and *b* about 10%) consist almost entirely of palmitic acid, and the liquid acids of oleic and linolic acids.—A. S.

Glycerol in hardened fats; Determination of—W. Normann and E. Hugel. Chem. Umschau, 1916, 23, 45—47. Z. angew. Chem., 1916, 29, Ref., 371.

THE glycerol content of hardened fats was determined by several of the published methods and the results obtained compared with those calculated from the ester values. The results obtained by the bichromate method agreed very well with the calculated values. Willstätter's method (this J., 1912, 997) gave satisfactory results, but the results obtained by the actin method were 1—1½% lower than the calculated values.—A. S.

Wool fat; Utilisation of crude—in the soap industry. W. Schrauth. Seifensieder-Zeit., 1916, 43, 437—438. Z. angew. Chem., 1916, 29, Ref., 372.

If crude wool fat be saponified and extracted with ether or the like, not only the alcohols (cholesterol, etc.) but also soaps of unsaturated fatty acids are dissolved. To overcome this difficulty, the wool fat is hydrogenised in presence of palladium at a low temperature, or fused with excess of caustic alkali (Varentzapp's reaction, see this J., 1916, 428) to convert the unsaturated into saturated fatty acids. The hydrogenised product is saponified under pressure, and the alcohols then extracted with ether; their physical properties are not affected by the hydrogenation. From the residue left after extraction with ether, the fatty acids are recovered by distillation with superheated steam under diminished pressure.—A. S.

Calcium and magnesium soaps; Solubility of—W. Fahrion. Chem. Umschau, 1916, 23, 34—35, 47—48. Z. angew. Chem., 1916, 29, Ref., 372.

ONE litre of water at 15°C. is capable of dissolving 90 mgrms. of oleic acid in the form of calcium salt and 224 mgrms. in the form of magnesium salt, but the solubilities vary considerably according to the experimental conditions. The solubility is greater in water containing sodium chloride. The solubility cannot be calculated from the quantity of dissolved lime or magnesia because the soaps are hydrolysed by water, the calcium soap to a greater extent than the magnesium soap. (See also Haupt, this J., 1915, 39.)—A. S.

Pink colour on the surface of fats. Knapp. See XIXA.

Comparison of results obtained by colorimetric and gravimetric determinations of cholesterol. Mueller. See XX.

PATENTS.

Catalyser and process of making same and for effecting catalytic reactions therewith. N. Sulzberger. New York. Reissue No. 14,197, July 18, 1916, of U.S. Pat. 1,143,332, June 15, 1915. Date of appl., May 4, 1916.

SEE this J., 1915, 822. Compounds of more than one metal, precipitated simultaneously, may be reduced to form the catalyst. Thus nickel and palladium may be used together. The use of the products as catalysts, especially for hydrogenating oils, is claimed.

Catalyst for the hydrogenation of unsaturated organic compounds [oils]. B. W. van E. Thieme and A. C. Geitel, Gouda, Netherlands. Ger. Pat. 292,894, Dec. 3, 1913. Under Int. Conv., Nov. 8, 1913.

NICKEL nitrate or other metallic nitrate is heated with an organic salt of nickel or other metal, or with the product obtained by moderate oxidation of glycerol with nitric acid, followed by neutralisa-

tion with nickel carbonate or other metallic carbonate. The catalysts thus prepared have a very pronounced emulsifying power, so that a very simple apparatus may be used for the hydrogenising operation, which can be performed at 140°—150°C.—A. S.

Fatty material; Process of hydrogenating unsaturated—J. C. C. Hoehn, Chicago, Ill. U.S. Pat. 1,189,817, July 4, 1916. Date of appl., Mar. 13, 1914.

THE unsaturated material, in which is suspended a finely divided catalyst, is exposed in open pans of large superficial area and of substantial depth to the action of hydrogen at a suitable temperature and pressure, while means are provided for withdrawing material from the exposed surface and introducing it into material near the bottom of the same or other pans without causing violent agitation.—C. A. M.

Oil or grease; Lubricating—J. H. Mackle, Waterliet, N.Y. U.S. Pat. 1,191,328, July 18, 1916. Date of appl., Oct. 17, 1914.

A MIXTURE of 85% of cottonseed oil and 15% of castor oil is heated to drive off volatile impurities, and afterwards decanted from sediment.—J. H. L.

Beeswax and the like; Washing—M. S. Salamon, London. Eng. Pat. 100,901, Feb. 21, 1916. (Appl. No. 2503 of 1916.)

SEPARATION of impurities is facilitated and the colour of the product improved by forcing a current of air for a short time through the hot water in which the melted wax is being washed.—C. A. M.

Oil from whale blubber; Process and apparatus for extracting—A. S. Myrens Verktsted, Christiania. Eng. Pat. 14,227, Oct. 7, 1915. Under Int. Conv., Oct. 10, 1914.

SEE U.S. Pat. 1,188,922 of 1916; this J., 1916, 898.

XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

Iron-gall inks. XIV. Gravimetric determination of gallic and tannic acids. R. Kempf. Mitt. K. Materialprüf., 1915, 33, 241—270.

THE high and discordant results frequently obtained in the determination of gallic and tannic acids in inks by the ethyl acetate method (this J., 1913, 281; 1914, 306), are due largely to the retention by the extracted tannin of acetic acid produced by hydrolysis of the ethyl acetate. Acetic acid retained by dry tannin cannot be expelled by heating at 100°C. in a vacuum oven, but can be removed by dissolving the tannin in water and evaporating the solution to dryness. It is recommended, therefore, that the residue from the ethyl acetate extract be dissolved in water, the solution evaporated, and the residue dried, these operations being repeated until the weight remains practically constant. By this modified method results agreeing within ±0.5 mgrm. or ±0.2% in parallel determinations can be obtained.—A. S.

Approximate determination of colophony in the gum-resins used in the rubber industry. Hutin. See XIV.

PATENTS.

Carbonate of lead [white lead]; Process and apparatus for the production of—G. Bevilacqua, Genoa, Italy. Eng. Pat. 9201, June 22, 1915.

MOLTEN lead is projected through an aperture

or apertures against a plane or cylindrical moving surface, either by the action of centrifugal force, capillarity, entrainment, or natural or mechanical pressure, the operation being carried out if necessary in an atmosphere of carbon dioxide or other inert gas. Suitable apparatus for the application of each of these methods is figured and described. The lead flakes thus obtained are introduced through a hopper into the hollow trunnion of a horizontal revolving drum, provided with internal perforated baffle-plates, or partitions, and perforated peripheral plates, which dip, continuously or intermittently, into water contained in the closed chamber in which the drum revolves. Acetic acid vapours, together with the necessary carbon dioxide and oxygen, preheated, are passed or drawn into the drum, where the formation of white lead takes place, the product forming a fine suspension in the water in the chamber. The excess of heated gases and condensable vapour passes into a second cylindrical drum, which is heated by it, and which is caused to revolve with its surface just dipping into a paste of the white lead removed from the first chamber to a floating box in the chamber surrounding the drying drum. As the white lead is taken up by the drum and dried it is removed by scrapers. Condensed acetic acid vapours can be drawn off from the drum, and a final condensation of the exit vapours is effected by means of a condensing worm.—E. W. L.

Lead oxide; Process for carbonating—— F. H. Sharpe, and The British and Colonial Lead Co., Ltd., Liverpool. Eng. Pat. 9488, June 29, 1915. Addition to Eng. Pat. 17,579, July 24, 1914 (this J., 1915, 92).

LEAD oxide suspended in water containing a small quantity of acetic acid, is introduced near the top into a vertical cylindrical vessel, the bottom portion of which tapers down to a comparatively small diameter. Near the bottom carbon dioxide is introduced through one, or preferably more jets in a direction nearly tangential to the wall of the vessel, so as to impart an upward spiral motion to the contents. Each jet is connected through two valves and an intermediate pipe, in which is a non-return valve, with the main gas-pipe encircling the vessel at a higher level, so that any jet can be disconnected separately for inspection and cleaning. For the latter purpose a plug or plunger is provided to each jet. Baffle-plates in the upper portion of the vessel deflect a portion of the gas to the centre. The contents of the vessel are discharged through a cock near the bottom, by means of the gas pressure in the vessel, the gas inlets being meanwhile left open, and a fresh charge is introduced immediately. Any sediment may be removed from the bottom of the vessel through another cock at the lowest level. The pressure in the vessel is regulated by a blow-off or safety valve. The gas passing from the vat may be passed through a second vat, but the complete process takes place in a single vat.—E. W. L.

Preservative coating composition; Manufacture of a—— J. Jacobs, Voorburg, Netherlands. Eng. Pat. 16,448, Nov. 22, 1915.

SHELL-LIME, calcined at a high temperature, and afterwards exposed for a considerable period to the action of air in a covered space, is purified, for instance by sifting, and is then mixed with a heated bituminous binding material, such as asphalt, bitumen, or petroleum pitch, in the proportion of from 2 to 25% of lime to 88 to 72% of bitumen. A diluent, such as toluene, benzene, solvent naphtha, or light tar-oil, and an alcohol or the like are then added. The composition is applied in layers 1—2 mm. thick to iron, wood, metals, cement, or the like.—E. W. L.

Lampblack machine. W. H. Davis, Muncie, Ind. U.S. Pat. 1,191,873, July 18, 1916. Date of appl., Oct. 10, 1914.

PREVIOUSLY-FORMED carbon flakes are fed from a conveyor into an inlet opening, controlled by a valve, at the upper end of a vertical agitating chamber containing rotary beating mechanism, and the finished carbon black is removed from the lower end of the chamber by means of a conveyor, operated alternately with the opening of the inlet valve.—E. W. L.

Paints; Method of making—— R. V. Brown, Pullman, Ill., Assignor to The Sherwin-Williams Co., Cleveland, Ohio. U.S. Pat. 1,192,163, July 25, 1916. Date of appl., Oct. 3, 1913.

LEAD linoleate or other water-insoluble soap of a drying vegetable oil is mixed with linseed oil with a relatively high acid value, or with another drying vegetable oil, and the mixture incorporated with a pigment distributed in water, with or without the application of heat. The oil replaces the water and incorporates the pigment and linoleate.—C. A. M.

Drying-rooms, especially for drying varnish, enamel, or the like. A. E. White, London. From Reliance Drying Room Co., Chicago, Ill., U.S.A. Eng. Pat. 100,869, Feb. 9, 1916. (Appl. No. 1930 of 1916.)

THE drying-room has double walls and ceiling. Near one side is a partition extending nearly from floor to ceiling, dividing the space into a larger drying-chamber and a smaller heating-chamber containing coils of heating-pipes. Deflecting plates are provided across the angles between ceiling and wall above the heating chamber, and on the opposite side of the drying chamber. A blower, fixed below the floor of the drying-room, discharges air upwards through the heating-chamber. The heated air is deflected downwards towards the opposite side of the drying-room, and from near the floor level is drawn through a duct leading beneath the floor, back to the blower. Provision is made for the regulated admission of fresh air through a side-branch of this duct, and the amount of re-circulated air can also be regulated by means of a damper.—E. W. L.

Plastic compositions; Method of making—— K. Tarassoff, Moscow, Russia. U.S. Pat. 1,187,869, June 20, 1916. Date of appl., Feb. 3, 1916.

A PHENOL is condensed with an aldehyde containing the methylene group (e.g., formaldehyde) in presence of a sulpho-acid having emulsifying properties, and of an aqueous solution of a protein.—E. W. L.

Condensation product and method of preparing same. L. V. Redman, Assignor to Redmanol Chemical Products Co., Chicago, Ill. U.S. Pat. 1,188,014, June 20, 1916. Date of appl., Feb. 24, 1914.

A MIXTURE of a phenolic body and hexamethylene tetramine, in the proportion of considerably more than one phenol group to one methylene group, is heated in the absence of water to about 130° C. to start an anhydrous reaction, which continues when the source of heat is withdrawn, ammonia being liberated, and the temperature rising to about 180° C. As the evolution of ammonia abates, further heat is applied and the temperature kept at about 180° C. until practically all the nitrogen is driven off from the mass. The product consists of phenylenedecasiligenosilagenin. It may be converted into an insoluble, infusible product by cooling below 120° C., and adding sufficient of a substance containing the methylene group to effect such conversion.—E. W. L.

[Varnish.] *Composition of matter and process of making same.* B. B. Goldsmith, New York. U.S. Pat. 1,188,439, June 27, 1916. Date of appl., Dec. 9, 1914.

THE varnish consists of a solution of a resin formed by heating together a phenol (carbolic acid), and a definite compound of formaldehyde and an amine (e.g., anhydroformaldehyde-aniline).
—E. W. L.

Varnish composition and process of making same; Waterproof. C. A. Hollenbeck, Elmhurst, and A. C. Horn, New York. U.S. Pat. 1,190,705, July 11, 1916. Date of appl., Dec. 30, 1914.

A HARD resin is melted and heated in order to render it soluble in a varnish vehicle; it is then solidified by cooling, re-melted, and incorporated with a sulphurised drying oil, e.g., Chinese wood oil, and a drier, and thinned to the consistency of a varnish by means of turpentine.—E. W. L.

Paint and process of making same. G. L. Davies and W. E. Windsor-Richards, London. U.S. Pat. 1,192,756, July 25, 1916. Date of appl., Feb. 6, 1913.

SEE Eng. Pat. 3008 of 1912; this J., 1913, 666.

Condensation products from phenols and formaldehyde; Process for making. L. Berend, Amöncburg, Germany. U.S. Pat. 1,191,390, July 18, 1916. Date of appl., Dec. 8, 1913.

SEE Eng. Pat. 15,875 of 1914; this J., 1915, 805.

Treatment or preservation of surfaces of metal sheets, bars, rods, wire, castings, etc. Eng. Pat. 11,917. See X.

XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Vulcanisation of rubber; Theory of [cold]. F. W. Hinrichsen and E. Kindscher. Mitt. K. Materialprüf., 1915, 33, 407—415.

ACCORDING to Weber (this J., 1894, 11) caoutchouc combines with sulphur chloride to form a series of compounds, of which $C_{10}H_{16}S_2Cl_2$ (23.62% S) is the member richest in sulphur. Measured quantities of a solution of purified Para rubber in dry thiophen-free benzene, were treated with quantities of a solution of sulphur chloride in benzene in excess of that corresponding to Weber's formula, and the reaction product was purified as described by Weber. In eight experiments the sulphur content found ranged from 15.58 to 28.37%. In another series of experiments, quantities of the rubber solution containing 0.5 grm. of rubber were treated with quantities of sulphur chloride solution containing from 0.433 to 1.299 grm. S_2Cl_2 , under conditions to exclude the presence of moisture, and after 3—4 weeks, portions of the solutions were withdrawn and analysed. The amount of sulphur chloride fixed by the rubber ranged from 0.2526 to 0.2795 grm., corresponding approximately to the formula $(C_{10}H_{16})_2S_2Cl_2$ (compare Bernstein, this J., 1912, 1087). The higher results obtained in the first series are attributed to adsorption of sulphur chloride or of sulphur liberated therefrom. The yellowish-white addition compound of caoutchouc and sulphur chloride when boiled with alcoholic sodium hydroxide solution is converted into a dark brown substance corresponding to the formula, $C_{20}H_{32}S_2$. In the technical cold vulcanisation process it is considered that adsorption of sulphur chloride by the rubber first takes place, followed by slow chemical combination and by liberation of sulphur from the excess of sulphur

chloride. Cold-vulcanised rubber may thus be regarded as an adsorption product of sulphur in a solid or semi-solid solution of the compound, $(C_{10}H_{16})_2S_2Cl_2$, in excess of rubber.—A. S.

Colophony; Approximate determination of—in the gum-resins used in the rubber industry. Hutin. Caoutchouc et Gutta-Percha, 1916, 13, 8994—8995.

ROsin is detected by saponifying 1 grm. of the gum-resin with the smallest possible quantity of caustic soda, diluting the mass with water, and adding the smallest possible excess of copper sulphate solution. In the presence of colophony a green copper resinate soluble in oil of turpentine is obtained. For an approximate determination, the finely pulverised sample is dissolved in 97 to 98% alcohol, the solution mixed with sand, and the mass evaporated to dryness on the water-bath. The residue is pulverised and mixed with more sand and alcohol and again evaporated. The process is again repeated, and finally the sand is extracted for 4 hours with chloroform in a Soxhlet apparatus. The colophony is dissolved, whilst the gum resin is left. Another method is to treat 1 grm. of the sample with 50 c.c. of 10% borax solution, which dissolves the gum-resin but not the colophony.—C. A. M.

PATENTS.

Latex; Process for coagulating—[by wood distillation gases]. E. C. R. Marks, London. From J. F. Baerveldt, jun., Bandjar, Java. Eng. Pat. 11,615, Aug. 11, 1915.

COAGULATION is effected by means of the gases produced by the destructive distillation of wood in retorts, after removal of the tar by known methods. The retorts are heated by means of a portion of the charcoal obtained from a previous distillation.—E. W. L.

Rubber; Process for the recovery of—from rubbered fabrics. C. de Villers, Neuilly, France. Eng. Pat. 10,146, July 12, 1915. Under Int. Conv., July 11, 1914.

RUBBER is recovered from fabric impregnated with vulcanised rubber, such as pneumatic tyre fabric, by heating it with boiling tetrachloroethane. Solution of the rubber is complete in about 1 hour. After removing the fabric, the rubber is recovered from the solution, by adding water and distilling off the solvent with the water; or the solvent may be distilled dry, provided care be taken not to overheat the rubber. If desired, the free sulphur may be removed by a short preliminary treatment of the rubbered fabric with hot tetrachloroethane, the operation being interrupted before the rubber begins to dissolve.—E. W. L.

Rubber; Process of reclaiming. H. R. Murdock, Naugatuck, Conn., Assignor to Rubber Regenerating Co. U.S. Pat. 1,189,282, July 4, 1916. Date of appl., Aug. 10, 1915.

FIBROUS, cellular material present in rubber waste is disintegrated by heating with a natural organic product containing protein.—E. W. L.

Rubber-waste; Reclaiming. H. R. Murdock, Naugatuck, Conn., Assignor to Rubber Regenerating Co. U.S. Pat. 1,189,721, July 4, 1916. Date of appl., Apr. 6, 1916.

RUBBER waste containing lead sulphide is treated with a reactive material, e.g., zinc sulphate, containing an acid radicle which will form a light-coloured, insoluble salt with lead, and a metal which will form a light-coloured sulphide with sulphur.—E. W. L.

Caoutchouc-like substances and process of making them. H. S. A. Holt, Assignor to Badische Anilin u. Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,192,310, July 25, 1916. Date of appl., July 30, 1913.

SEE Fr. Pat. 459,005 of 1913, and Addition thereto; this J., 1913, 1164. Zinc balls may be used instead of porcelain balls.

XV.—LEATHER; BONE; HORN; GLUE.

Eggs; The denaturing of—[for tanneries]. J. S. Rogers. J. Amer. Leather Chem. Assoc., 1916, 11, 412—425.

EXPERIMENTS were confined to the denaturing of egg-yolk preserved by the addition of 20% of salt, as it is believed to be impracticable to denature eggs without removing the shell. Only sound eggs which passed the food standard were used for the preparation of the yolk. 2% of birch tar oil rendered the egg-yolk inedible, and such denatured egg-yolk when used in preparing food rendered the food inedible if at least 7% of denatured egg-yolk was used. Experiments in tanneries showed that such egg-yolk used in the manufacture of leather gives entirely satisfactory results, even in the case of white or delicately coloured leathers.—F. C. T.

Leathers; Wear resistance of sole—, L. Balderston. J. Amer. Leather Chem. Assoc., 1916, 11, 429—440.

SMALL samples of sole leather were fixed on the circumference of a wheel revolving in contact with another wheel of the same size. The surface of the second wheel was of roughened steel, and its speed in the ratio 4:5 compared with that of the first, giving a slip of 0.15 inch on each sample. The two wheels were drawn together by a spring, the tension of which was adjustable from zero to 100 lb. In one set of experiments the tension was set at 40 lb., and the apparatus run for 50,000 revolutions in 30 hrs. The loss in weight of the samples (after allowing for loss of moisture) varied from 5.8% in the case of chrome leather to 11.5% with hemlock-tanned leather, and 25.8% with a leather substitute.—F. C. T.

Supplies of tanning materials. War Office announcement.

THE Secretary of the War Office announces that an Order has been made by the competent military authority requiring all persons having in their custody or under their control any stocks or having made contracts for the supply of any of the following tanning materials, viz.:—Chestnut extract, oak extract, quebracho extract, hemlock extract, myrabolams, myrabolan extract, mimosa bark, mimosa extract, gambier, divi-divi, algarobilla, valonia, and sumach—to furnish to the Director of Army Contracts (R.M.S.) at Imperial House, London, S.W., particulars of their stocks, their contracts on the 9th September, and their requirements for the five months September, 1916 to January, 1917. Any person concerned who has not yet received a form on which to make the required return should apply at once to the Director of Army Contracts (R.M.S.) at the above address.

PATENTS.

Gloves; Treatment of leathers and skins used in the manufacture of—, Soc. Anon. des Gants Alexandre, Paris. Eng. Pat. 100,311, Apr. 12, 1916. Under Int. Conv., Apr. 21, 1915. (Appl. No. 5381 of 1916.)

AFTER tawing, the leather is floated in a dressing

bath prepared from egg-yolk and salt, together with such antiseptic substances as the methyl or ethyl esters of benzoic and salicylic acids. Other substances such as essential oils are also added to the bath. The antiseptics thus incorporated in the leather sterilise perspiration from the hands, thus lengthening the life of the gloves and protecting the hands of the wearer.—F. C. T.

Tanning of hides and skins. E. W. Merry, Sheffield, Assignor to International Pyrotan Co., Ltd., London. U.S. Pat. 1,191,527, July 18, 1916. Date of appl., Jan. 12, 1916.

A TANNING solution consists of crystallised alum, 5 to 7 parts, and anhydrous sodium pyrophosphate, 1 part, the amount of alum used being approximately 10%, and the quantity of water in the bath 20—40% of the weight of hide to be tanned. For example a bath may consist of water 27, alum 10, sodium pyrophosphate 1.66, and common salt (a pore-opening agent) 5% of the total weight of hide.—E. W. L.

Leather; Material for use in manufacture of imitation—, W. O. Stoddard, jun., Madison, N.J., U.S.A., Assignor to The Duratex Co., Newark, N.J. U.S. Pat. (A) 1,190,806 and (B) 1,190,807, July 11, 1916. Dates of appl., Dec. 29, 1914, and Feb. 18, 1915.

(A) The material consists of a fabric coated with nitrated cotton and an oil, e.g., rape oil, with a superimposed baked coating of a japanning composition. (B) A fabric is coated with a composition containing nitrocellulose and leather, with or without an oil, after which a coating of a japanning composition may be baked on.—F. C. T.

Gelatinising substances; Methods for finely dividing—, Aktienges. für Chemische Produkte vorm. H. Scheidemann, Berlin, Assignees of L. Askenasy, Karlsruhe, Germany. Eng. Pat. 15,365, Nov. 1, 1915. Under Int. Conv., Oct. 30, 1914.

HOT solutions of gelatin or gelatinising substances are introduced, in drops, into a cooling liquid such as benzene or carbon tetrachloride, whereby a perfect separation of solidified substance into granules is effected. The solution may be atomised before cooling, or driven through filter-cloth covering a centrifugal rotor rotating in the cooling liquid. Oils or fats may be added to the cooling bath or to the solution to ensure better separation with inferior grades of gelatinising substance. (See also Eng. Pat. 100,392 of 1916; this J., 1916, 855.)—F. C. T.

Glue and gelatin; Manufacture of—, K. Twele, Wladislau, Moravia. Ger. Pat. 293,047, Feb. 19, 1915. Under Int. Conv., Feb. 19, 1914.

SINews, alum-tawed leather scraps or other leather waste are treated with a solution of sodium chloride, washed, and worked up into glue in the usual way.—A. S.

Casein; Manufacture of horn-like masses from—, A. Bartels, Harburg, Germany. Eng. Pat. 10,049, July 9, 1915.

AN apparatus is described whereby slightly moistened granular casein, either naturally hard or artificially hardened, is first strongly compressed to expel air and subsequently kneaded by forcing through sieve-like obstacles, the kneading being aided by heat. The process is continuous.—F. C. T.

Tanning. O. Schmidt, Assignor to Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. U.S. Pat. 1,191,480, July 18, 1916. Date of appl., Dec. 4, 1913.

SEE Fr. Pat. 462,635 of 1913; this J., 1914, 326.

Leather substances; Method of manufacturing—
C. Roessler, Hamburg, Germany. U.S. Pat.
1,192,460, July 26, 1916. Date of appl., Aug. 28, 1913.
SEE Eng. Pat. 19,787 of 1913; this J., 1914, 559.

XVI.—SOILS; FERTILISERS.

Protozoa; Further observations on the relation of
— to soil bacteria. T. Goodey. Roy. Soc.
Proc., 1916, 89, B, 297—314. (See this J.,
1915, 438.)

THE immediate object of the investigation was to trace the effect of inoculating protozoa, freed as far as possible from bacteria, into partially sterilised soil. The soil selected was a fibrous loam obtained from stacked turf, and the partial sterilisation was effected by treating it with 2% of toluene and then heating for 2 hours at 65° C. This treatment removed nearly all the protozoa contained in the soil. To obtain protozoa free from bacteria, a mixed culture obtained from soil was made in a 1% hay infusion, and then by means of a 220-volt current passed between non-polarisable electrodes, the protozoa were driven into a medium containing no bacteria. In this way the bacterial number was reduced from about 36 million to 300,000 per c.c. of liquid. Amœbæ were also obtained free from bacteria by cultivating a single cyst on agar to which *Bacillus fluorescens non-liquefaciens* was added, and after the organism had developed and multiplied, the bacteria were destroyed by adding 2% hydrochloric acid, leaving the protozoa uninjured. The number of protozoa was estimated by making cultures in 1% hay infusion (best for ciliated protozoa), and on agar plates (especially good for amœbæ); bacterial counts were made by the gelatin plate method. When large numbers of protozoa, with or without bacteria, were inoculated into the partially sterilised soil, little or no multiplication was observed, and the bacterial counts failed to show any relation between the numbers of protozoa and of bacteria. The residual protozoa of treated soil, also, did not increase in number although the conditions were very favourable for bacterial development. Hence a treated soil, by itself, is an unsuitable medium for the existence of active trophic protozoa. *Per contra*, definite evidence in favour of the Russell-Hutchinson hypothesis that diminution of the number of bacteria is a direct effect of increase in the number of protozoa, was obtained from the experiments in which 5% of untreated soil was mixed with the partially sterilised soil. The fall in the number of bacteria (after a short initial rise) was accompanied by an increase in the number of protozoa, and an amœba of the *limax* group was found to be especially active in bringing about this effect. The observed increases in the number of protozoa ranged from 600 in one experiment, and from 150 in another, to 30,000 per gram of soil in each case, and it is suggested that for a given soil the number of bacteria does not begin to wane until the number of protozoa has reached a definite figure. Two other kinds of amœbæ, flagellates, and certain large ciliates were found to co-operate in exterminating the bacterial population.—E. H. T.

Phosphates; Availability of mineral—for plant nutrition. W. L. Burlison. J. Agric. Res., 1916, 6, 485—514.

Pot experiments extending over three years were made with cereals and legumes grown in purified sand with a constant supply of nitrogen and potassium, and manured with varying quantities of different natural phosphates found in America. The crops obtained were weighed and analysed for their content of phosphate. Even in the absence

of organic matter, the plants assimilated the phosphate readily and good crops were obtained. The yields tended to be better, the larger the quantity of phosphate used. The amount of phosphate taken up was not the same with each variety of mineral. It was thought that the presence of plant foods, namely, the nitrogen and potassium solution used, and the addition of water, might render the phosphate more soluble, but it was found that when the minerals were shaken daily with the nutrient solution for three months, very little more phosphate was dissolved. The influence of the presence of organic matter was investigated by adding dextrose solution and an infusion from a rich soil with the mineral. The fermenting dextrose proved to be injurious, even when the acidity produced was neutralised by calcium carbonate. When plant residues were used as the organic matter, the result was beneficial. The plants obtained their supply of calcium from the phosphates, as addition of calcium carbonate did not improve the results. The amount of phosphate taken up increased with the degree of fineness of the mineral. No relation was noticed between the citric acid solubility of the mineral and the availability of the phosphate for the plant.—J. H. J.

Manganese; Action of—on plant growth. G. Masoni. Staz. Sperim. Agrar. Ital., 1915, 48, 822—838. Bull. Agric. Intell., 1916, 7, 345—346.

ACCORDING to Pugliese, the uncertain results of the action of manganese as a fertiliser are probably connected with the failure of the observers to recognise the existence of a definite optimum ratio between iron and manganese in the soil. Experimenting with the sulphates of manganese, sodium, and iron, in quantities containing equivalent amounts of the sulphate radical, it was found that manganese and sodium sulphates gave equally good results, that the former was more injurious than beneficial, and that any good effects following its use were a consequence of the action of the acid radical and of the substance *qua* soluble salt. Pot experiments were carried out in 1912 with maize, followed by buck wheat, and in the two succeeding years with maize. The following weights (in mgrms. per kilo. of soil) were used: manganese 5—50, sodium 4.16—49.85, SO₄-radical 8.72—104.30, chlorine (as chloride) 12.97—64.85, and CO₃-radical 27.45—137.25. The conclusion reached was that manganese compounds exert a favourable influence on plant life, whether used in small or large quantities, but that this effect is not due to the specific action of the manganese, since the corresponding sodium or calcium compounds are equally, and in some cases more beneficial. The varying effect of manganese salts can sometimes be attributed to their action as salts, particularly if easily soluble, and to the nature of the acid radical.—E. H. T.

Nutrient solution; A three-salt—for plants. J. W. Shrive. Amer. J. Botany, 1915, 2, 157—160. Bull. Agric. Intell., 1916, 7, 349—350.

THE solution contains monopotassium phosphate, calcium nitrate, and magnesium sulphate, and does not readily become turbid. The mixed salts were tested in solutions of constant molecular concentration, but with varying proportions of the ingredients, on wheat and buckwheat. The results were very satisfactory and superior to those obtained with the four-salt nutrient solutions of Knop and of Totttingham. For wheat the most favourable composition was: potassium phosphate 0.0180 m., calcium nitrate 0.0052 m., magnesium sulphate 0.0150 m. (m = gm.-molecules per litre); and for buckwheat: 0.0144 m., 0.0052 m., 0.0200 m., respectively.—E. H. T.

New and sensitive indicator for acidimetry and alkalimetry, and for determination of hydrogen ion concentrations between limits of 6 and 8 on the Sørensen scale. Bogert and Scatchard. See XXIII.

PATENTS.

Fertiliser; Preparing concentrated——. W. H. Ross and A. R. Merz. Washington, D.C. U.S. Pat. 1,191,615, July 18, 1916. Date of appl., Apr. 11, 1916. (Dedicated to the public.)

A FERTILISER, having the composition $x\text{KH}_2\text{PO}_4 + y\text{NH}_4\text{H}_2\text{PO}_4$, is formed by treating one equivalent of phosphate rock with ten equivalents of phosphoric acid, thus forming three equivalents of "calcium mono-phosphate" with an excess of six equivalents of phosphoric acid. Ignited alunite, potassium sulphate or carbonate is added in amount sufficient to precipitate the calcium as sulphate or carbonate, which is then filtered off, and gaseous ammonia is added till the filtrate is neutral to cochineal. As an alternative less phosphoric acid may be used at first, and the excess of acid added just prior to passing the ammonia. The liquid is concentrated, until on cooling the mass becomes solid.—B. N.

Phosphates; Treating——. C. G. Memminger, Lakeland, Fla., Assignor to Coronet Phosphate Co., New York. U.S. Pat. 1,192,545, July 25, 1916. Date of appl., Dec. 4, 1915.

RAW phosphate material, containing free silica, is heated under oxidising conditions, so as to decompose the contained calcium carbonate and cause the resulting lime to combine with the silica.

—F. SODN.

Fertiliser containing [calcium] cyanamide and calcium phosphate; Manufacture of a——. M. Zollenkopf, Königsberg. Ger. Pat. 293,258, May 5, 1915.

CALCIUM carbide is dissolved in molten basic slag, the mass is cooled to a suitable temperature, and subjected to the action of nitrogen under pressure in a closed ball-mill, so that the reaction-mixture is continuously agitated and progressively disintegrated.—A. S.

Manufacture of ammonium phosphate. Ger. Pat. 292,530. See VII.

XVII.—SUGARS; STARCHES; GUMS.

Sugars; Some numerical relations among the rotatory powers of the compound——. C. S. Hudson. J. Amer. Chem. Soc., 1916, 38, 1566—1575.

THE molecular rotatory power of sugars of the sucrose group, i.e., those which invertase decomposes into levulose and an aldose, may be regarded as the algebraic sum of three factors. One factor represents the rotation due to the aldose chain apart from its terminal (lactonic) asymmetric carbon atom, and is equal to the mean of the molecular rotatory powers of the α - and β -forms of the free aldose. The other factors represent respectively the rotation due to this lactonic carbon atom, and that due to the levulose residue, and both of these are invariable for sugars of this group. From these considerations the author concludes that for sugars hydrolysable by invertase (sucrose, raffinose, gentianose, and stachyose), the molecular rotatory power (specific rotatory power \times molecular weight) of the aldose hydrolytic product is less than that of its parent sugar by 2340 for its α -form and 19,300 for its β -form. The data available at present confirm this conclusion, and the author applies the principle of

the additive character of optical rotatory power to other groups of polyoses.—J. H. L.

Deterioration of sugar used for making lemonade. Haddon. See XIXA.

PATENTS.

Sugar juice; Process and apparatus for the evaporation of——. L. Naudet, Chelles, France. U.S. Pat. 1,190,317, July 11, 1916. Date of appl., June 28, 1915.

IN a multiple-effect apparatus the inflow of juice to each unit is made to accelerate the flow of juice already in the unit over the heating surface. Each evaporator has combined with it an external supplementary tubular heater, through which juice from the evaporator can circulate, passing through a pipe from the bottom of the evaporator to the bottom of the supplementary vessel and returning from the top of the latter through a second pipe. This circulation is promoted by the injector action of the juice entering the unit (from the preceding one), the supply conduit being connected to the bottom of the supplementary heater.—J. H. L.

Starches; Apparatus for making modified——. A. W. H. Lenders, Cedar Rapids, Iowa. U.S. Pat. 1,191,324, July 18, 1916. Date of appl., Sept. 17, 1915.

THE apparatus comprises means for mixing starch with an acid, and delivering the mixture into a hollow element having a wall perforated with narrow slits through which the material is forced by the rapid rotation of beaters inside the hollow element.—J. H. L.

Starch from amylaceous materials; Process for obtaining——. K. Poche, Vienna. Ger. Pat. 292,864, Jan. 8, 1914. Under Int. Conv., Jan. 5, 1914. Addition to Ger. Pat. 292,482.

THE material is subjected to the action of bacteria such as those described in the chief patent (see page 938), which are capable of decomposing cellulose without attacking the starch.—A. S.

Process for converting cellulose into fermentable carbohydrates. Ger. Pat. 292,482. See XVIII.

XVIII.—FERMENTATION INDUSTRIES.

Amylase of Aspergillus oryzae. H. C. Sherman and A. P. Tanberg. J. Amer. Chem. Soc., 1916, 38, 1638—1645.

THE amylase of *Aspergillus oryzae* exerts its maximum activity, both amylolytic and saccharogenic, in a very slightly acid medium. "Saccharogenic power" is measured by the amount of maltose formed at 40° C. by the action of the enzyme on an excess of starch for 30 minutes. Acid phosphates accelerate and alkaline phosphates retard the action. Addition of neutral electrolytes, such as sodium and potassium chlorides, to commercial taka-diastase, has no measurable effect on the saccharogenic power, but increases the amylolytic action. Preparations thirty times as active as taka-diastase were made from the latter by extracting with water, precipitating with ammonium sulphate, dialysing, and precipitating fractionally with alcohol. Such preparations are not so active as purified pancreatic amylase (see this J., 1911, 973); they have higher amylolytic but lower saccharogenic power than the most active preparations of malt amylase yet described. The high ratio of amylolytic to saccharogenic power, which is characteristic of commercial taka-diastase, is shown in at least equal degree by

purified preparations. The purest specimens obtained by the authors gave protein reactions and contained about 11% of nitrogen and 2% of ash.
—J. H. L.

Citric acid by fermentation. J. A. Martin. Amer. J. Pharm., 1916, 88, 337—355.

THE author studied the production of citric acid in sugar solutions by a mould probably identical with the *Citromyces tollensianus* of Wehmer (see this J., 1910, 37), this having been found to produce much larger quantities than other moulds investigated. A 10% dextrose solution containing nutrient salts was inoculated with spores of the mould and maintained at 20° C. in presence of air. Growth was noticeable after 4 days, and the liquid later became covered with a thin, velvety, green layer. The production of citric acid commenced after about 5 days, and reached its maximum in 24 days, when it amounted to 20% of the sugar originally present. The citric acid remained in the uppermost layers of liquid, and for this reason as well as to ensure free access of air the experiments were conducted in shallow vessels. By adding calcium carbonate from time to time, to neutralise the acid, and extending the duration of the experiments to 60 days, it was found possible to increase the yield to 43% of the weight of sugar employed. The production of citric acid by this means requires a neutral or slightly acid medium containing suitable salts and not more than 10% of sugar. As the process is one of oxidation, free access of air is necessary. The temperature should be carefully regulated, but light has no influence. The author suggests that the process might be used industrially after further study. The cultures would, however, be very liable to invasion by other moulds, most of which grow more rapidly than the one employed in these experiments.—J. H. L.

Wine containing free sulphuric acid. W. I. Baragiola and O. Schuppli. Z. anal. Chem., 1916, 55, 369—377.

AN Alsatian white wine (1889 vintage) examined by the authors contained about 0.1% of free sulphuric acid.—W. P. S.

Alcohol; Determination of very small quantities of water in — by means of the critical solution temperature. V. Rodt. Mitt. K. Materialprüf., 1915, 33, 426—433.

THE method devised by Crismer (this J., 1904, 451; 1907, 32) has been re-investigated and proved to be capable of giving extremely accurate results. A suitable petroleum oil giving sharp indications without artificial cooling may be prepared by mixing transformer oil with commercial paraffin oil. For standardising the oil, perfectly anhydrous alcohol must be prepared. About 2 litres of 99% alcohol is placed in a large flask with 300 grms. of quicklime and the flask is suspended in a water-bath which can be quickly removed. The alcohol is gently boiled for some days under a reflux condenser protected by a phosphorus pentoxide guard-tube. The condenser is then reversed and arranged to deliver the distillate into a wide, corked burette, also guarded with moisture-absorption tubes. Successive portions of alcohol are distilled over into the burette and tested with the petroleum until a constant minimum value is attained. For the test, all the apparatus must be dried in an oven at 150° C. and every precaution taken against access of atmospheric moisture. An Erlenmeyer flask of about 50 c.c. capacity, fitted with rubber stopper, is accurately tared, a few drops of water are introduced rapidly from a pipette and the weight noted, then 15—25 c.c. of alcohol is drawn from the distillation burette and

the flask is weighed again, so that the gravimetric composition of the aqueous alcohol is accurately known. The rubber stopper is replaced by another, also dried in the oven, having two holes, through one of which passes a standardised thermometer, reading to 0.2° C., and through the other a short glass rod. The glass rod is withdrawn, the point of a burette being inserted through the hole, and a measured volume of petroleum is run in, calculated from its sp.gr. to amount to 48/52 by weight of the alcohol employed; the measurement should be accurate to 0.1 c.c. The rod is replaced, the contents of the flask are warmed with gentle rotation until the liquid is perfectly clear, and rotation is continued while cooling until a sudden sharp clouding of the solution appears. The critical temperature may be noted with an accuracy of 0.2° C., corresponding to 0.01% of water in the alcohol. A standardisation curve is plotted for a given petroleum oil which may be used subsequently for rapid and simple estimations of water in strong spirits; the rise of critical temperature is almost a straight line function of the percentage of water within the limits of 0—2.5%.—J. F. B.

Effect of feeding on the composition of milk and butter. Dried yeast and decorticated cottonseed meal. Cranfield and Taylor. See XIXA.

PATENTS.

Diatyptic product; Process in making —. J. Takamine, New York. U.S. Pat. 1,192,581, July 25, 1916. Date of appl., July 1, 1912.

THE fungus Koji, which contains diastase, is grown on a medium free from alkalinity and moistened with solutions of sodium chloride and an antiseptic. Preparations rich in diastase and having an abnormal resistance to antiseptics are thus obtained.—J. H. J.

Cellulose; Process for converting — into fermentable carbohydrates. K. Pecha, Vienna. Ger. Pat. 292,482, Nov. 23, 1913. Under Int. Conv., Nov. 20, 1913.

CELLULOSIC material is subjected to the action of bacteria capable of decomposing cellulose, and the resulting mucilage is converted into fermentable carbohydrates by the action of steam under pressure, alkalis, acids, or enzymes such as cytase. Suitable bacteria can be isolated from putrefying radishes; or *Micrococcus cytophagus* or *M. melanocyclus* may be used.—A. S.

Bread-improver and process of making same. U.S. Pat. 1,190,827. See XIXA.

XIXA.—FOODS.

Milk and butter; Effect of feeding on the composition of —. Dried yeast and decorticated cottonseed meal. H. T. Cranfield and M. G. D. Taylor. Analyst, 1916, 41, 240—245.

DRIED yeast was found to be an excellent food for dairy cows as regards the quality of the milk and butter. There was no appreciable difference between the butters obtained from cows fed on dried yeast and cottonseed meal rations, respectively, the only variation in the composition of the butter fat being noticed in the case of the Polenské values, where the dried yeast feeding gave the higher figures. The dried yeast ration slightly increased the yield of milk and the fat content of the milk, the average percentage of fat being 3.77 for the dry yeast feeding and 3.72 for the cottonseed meal ration. (See also this J., 1915, 1108.)
—W. P. S.

Milk; Acidity of fermented —. A. Chouttine. Pharmzevtizieski J., 1916, 110. J. Pharm. Chim., 1916, 14, 109—112.

THE acidity of fermented milk being due to the presence of lactic acid, dissolved carbon dioxide, acid phosphates, casein compounds, and products resulting from hydrolysis of the proteins, the acidity value varies according to the conditions under which it is determined. Titration with potassium hydroxide solution, using phenolphthalein as indicator, yields the lowest but most concordant results, provided that the titrations are always made under the same conditions. Calcium hydroxide and barium hydroxide solutions yield higher figures, but with these the former sometimes yields lower, sometimes higher, results than does the latter.—W. P. S.

Fats; Pink colour on the surface of —. A. W. Knapp. Chem. News, 1916, 114, 73.

MARGARINE fats when exposed to the air of the laboratory frequently become pink. This is due to the presence of an azo dyestuff, probably dimethylaminoazobenzene, or "Butter Yellow," which is very sensitive to acid and alkaline vapours. To detect such azo dyestuffs in butter or margarine, the filtered fat is allowed to solidify in a small beaker, which is then placed in a crystallising dish at the bottom of which is filter paper saturated with strong hydrochloric acid. The dish is covered and left for two hours, and if an azo dyestuff be present a pink coloration gradually diffusing from the surface of the fat will then be seen. The rate of the diffusion of the acid vapours may be measured by the growth of the red layer. In the case of a butter fat containing 0.01% of the azo-dyestuff, the pink layer had penetrated $\frac{1}{8}$ in. in one day, $\frac{1}{2}$ in. in 2 days, and 2 in. in 49 days.—C. A. M.

Casein; Influence of alkali and alkaline-earth salts upon the rate of solution of — by sodium hydroxide. T. B. Robertson and K. Miyake. J. Biol. Chem., 1916, 25, 351—361.

THE relation between the time and the amount of casein dissolving in sodium hydroxide solutions is expressed by the equation $x = Kt^m$, where x is the number of grams of casein dissolved, t is the time, and K and m are constants depending on the concentration of the alkaline solution and the total mass of casein present in the mixture. This relation holds good even in presence of alkali or alkaline-earth chlorides, though the rate of solution is decreased to an extent depending on the concentration of the salt employed. The alkaline-earth chlorides in $N/200$ -concentration retard the rate of solution to approximately the same extent as 100 times this concentration of an alkali chloride. Whilst the value of K decreases, that of m increases with increasing concentration of the salts. The product Km , designated the coefficient of penetration, decreases with increasing concentrations of NaCl , KCl , CaCl_2 , SrCl_2 , or BaCl_2 , between the limits of concentration employed, the acceleration of the decrease being positive in the first two cases, and the negative in the latter. Lithium chloride increases the value of Km , but with a negative acceleration, so that, with concentrations higher than $N/3$, a decrease is observed.—G. F. M.

Cacao products; Determination of fat in —. W. Lange. Arb. Kaiserl. Gesund., 1915, 50, 149. Chem.-Zeit., 1916, 40, Rep., 246.

WHEN the Soxhlet apparatus is used, complete extraction of fat from cocoa powder, etc., requires up to 25 hours, and notable quantities of alkaloids and other substances are also dissolved.

By the following method extraction can be effected in $\frac{1}{2}$ —1 hour. A wide-necked flask of 250 c.c. capacity is used, fitted with a rubber stopper which carries a tube leading to a water-pump and a filter-tube, 3.5—4 cm. diam. and 8 cm. long. A Witt's filter-plate, with openings of $\frac{1}{2}$ —1 mm. diam., is fitted inside the filter-tube and carries a layer of asbestos 3—4 cm. thick. Water is drawn through the layer of asbestos with the aid of the pump until particles of asbestos no longer pass through, and 5—10 grms. of cocoa powder or of grated chocolate is then introduced, levelled with a glass rod, and covered with 10—15 c.c. of ether, the tube being then closed by a watch-glass. When the ether begins to drain through, suction is applied cautiously. The operation is repeated, using 7—10 c.c. of ether each time, until a quantity of about 100 c.c. has been used. The flask is then replaced by a fresh one, and the extraction continued until a further 50 c.c. of ether has been used. The residue obtained by evaporating the ether extract is dried in a steam-oven until of constant weight. The amount of fat found in nine samples of cocoa ranged from 50.9% (Venezuela, Caracas) to 57.3% (Kamerun).—A. S.

Benzoic acid [in foods]; Modification of the so-called Mohler's reaction for —. J. Grossfeld. Z. Unters. Nahr. Genussm., 1915, 30, 271. Chem.-Zeit., 1916, 40, Rep., 266. (See this J., 1890, 770.)

THE benzoic acid is extracted as usual with ether or other solvent, the solution evaporated, the residue heated with 0.1 gm. of potassium nitrate and 1 c.c. of concentrated sulphuric acid for 20 mins. on a boiling water bath, then cooled, treated with 2 c.c. of water, again cooled, treated with excess of ammonia, and mixed with 2 c.c. of a solution of 2 grms. of hydroxylamine hydrochloride in 100 c.c. of water. The red coloration produced if benzoic acid is present develops more quickly if the tube is immersed in hot water and then cooled. Cinnamic acid and benzene give similar colorations, but benzoic acid can be distinguished from salicylic acid by the test.—A. S.

Sugar used for making lemonade; Deterioration of —. E. Haddon. Bull. Soc. Chim. de Maurice, 1916, 7, 12—13. Int. Sugar J., 1916, 18, 383.

INSTANCES of deterioration of lemonade due to fermentation, in Mauritius, were traced to the presence of the organism *Bac. levaniformans* (Greig Smith and Steel, this J., 1902, 1381) in the sugar used. The organism was isolated by adding 1 gm. of the sugar to 25 c.c. of a solution containing 5 grms. of potassium chloride, 2 grms. of sodium phosphate, and 2 grms. of ammonium nitrate per litre, heating in a boiling water-bath for 20 mins., and then keeping in a dark room for 3 days at 27°—30° C., after which a sub-culture in a tube of gelatin was made. It is recommended that the syrup used for making lemonade be sterilised in an autoclave at 120° C., and that all containing vessels also be sterilised.—A. S.

Non-protein nitrogenous constituents of feeding stuffs. H. S. Grindley and H. C. Eckstein. J. Amer. Chem. Soc., 1916, 38, 1425—1431. (See also Hart and Bentley, this J., 1915, 1161.)

A COLD-WATER extract of the feeding stuff was treated with colloidal ferric hydroxide to precipitate the proteins, and after filtering, the different forms of nitrogen compounds in the filtrate were determined; the acid-amide nitrogen was determined as ammonia after hydrolysis with 20% hydrochloric acid, and the amino-acid nitrogen by Van Slyke's nitrous acid method (this J., 1911, 771, 1135). The results obtained are shown in the following table:—

Nitrogenous constituents of protein-free solution expressed as percentages of total nitrogen of feeding-stuff.

	Total nitrogen.	Free amino-nitrogen.	Humic nitrogen.	Free amino-acid nitrogen.	Free and combined acid-amide nitrogen.	Combined amino-acid nitrogen.	Residual soluble nitrogen (by diff.).
	%	%	%	%	%	%	%
Alfalfa hay	17.55	1.11	1.44	5.04	3.35	3.13	3.48
Timothy hay	15.43	1.47	2.68	4.83	2.64	1.17	2.64
Blood meal	1.87	0.17	0.08	0.57	0.43	0.50	0.10
Corn (maize)	5.65	0.68	0.30	2.17	1.08	0.54	0.99
Clover hay	14.22	1.08	1.78	4.37	1.29	0.24	4.56

The results show that the greater part of the nitrogen of the soluble non-protein nitrogenous constituents of feeding stuffs exists in forms that result from the decomposition of proteins by hydrolysis, and hence only a small part, if any, of these non-protein constituents can interfere with the application of the Van Slyke method to the estimation of the free and combined amino-acids and amides of feeding stuffs (see this J., 1915, 848; 1916, 65).—A. S.

Denaturing of eggs [for tanneries]. Rogers. See XV.

PATENTS.

Bread-improver and process of making the same. R. W. Wahl, Chicago, Ill. U.S. Pat. 1,190,827, July 11, 1916. Date of appl., Jan. 21, 1916.

A CONCENTRATED yeast-food for use in making bread, and containing salts of lactic acid and lactic bacteria, is prepared by growing lactic bacteria in a mash, neutralising the lactic acid by means of a base as it is produced, separating the liquid from the exhausted solid material, and concentrating.—J. H. L.

Beverage extracts [coffee substitutes]; Manufacture of— J. L. Kellogg, Battle Creek, Mich., U.S.A. Eng. Pat. 17,255, Dec. 8, 1915.

EXTRACTS containing the soluble constituents of roasted and ground algaroba (carob) bean and those of roasted and ground amylaceous materials such as wheat or soya beans, are concentrated and caramelised.—J. H. L.

Beverage; Non-alcoholic concentrated—and process for its manufacture. H. Laessig, Berlin. U.S. Pat. 1,191,440, July 18, 1916. Date of appl., Aug. 6, 1914.

MILK serum containing lactic acid is mixed with material containing cane sugar under such conditions that the sugar is inverted. The proportion of lactic acid to sugar is about 4 : 100. The product is stable on exposure to air, and on addition of water forms a non-alcoholic beverage.—J. H. J.

Cream; Process of making artificial— H. C. Beckman and G. E. Dyck, Assignors to National Synthetic Products Co., Chicago, Ill. U.S. Pat. 1,190,369, July 11, 1916. Date of appl., Sept. 19, 1912.

A MIXTURE of an oleaginous base with a milk base, to which casein may be added, is pasteurised and emulsified. A binding agent such as starch may be added, or the product may be subjected to the action of oxygen or ozone.—J. H. L.

Fodder; Process for making— R. R. Renshaw, Ames, Iowa. U.S. Pat. 1,190,953, July 11, 1916. Date of appl., Sept. 2, 1914.

CELLULOSIC materials rich in pentosans are heated under pressure with an inorganic acid, so as to hydrolyse the pentosans without materially affecting the cellulose. The pentoses thus pro-

duced may be removed, or after the acid has been neutralised the resulting mass may be dried.

—J. H. L.

Ensilage; Towers or buildings for the fermentation and storage of—, or for the storage of grain W. Thompson, Wexford, Ireland. Eng. Pat. 11,041, July 30, 1915.

XIXB.—WATER PURIFICATION; SANITATION

Water; Influence of algae in sand filters used in the purification of— F. Diénert and L. Gizolme. Comptes rend., 1916, 163, 127—130.

THE reduction of the alkalinity of a water, during its passage through an open sand filter, owing to the action of the algae (see Gizolme, this J., 1915, 1068), is a direct measure of the purifying power of the filter. For instance, when the alkalinity has been reduced by about 4 mgrms. of calcium carbonate per litre, *B. coli* disappear from the water and the total number of organisms present is reduced by about 85%.—W. P. S.

Oscillaria prolifica; Chemical composition of— B. B. Turner. J. Amer. Chem. Soc., 1916, 38, 1402—1417.

Oscillaria prolifica (Cyanophyceae), a blue-green alga causing much trouble with water supplies when air-dried contains 9.7% of moisture, 6.4% of ash, and 46.25% of protein, the remainder consisting chiefly of carbohydrates. The alga does not contain saponin in appreciable quantities but contains a glucoside or polysaccharide having physical properties similar to those of saponin together with a pectin-like carbohydrate hydrolysed very slowly by boiling 5% sulphuric acid and yielding first a non-reducing dextrorotatory substance which on further hydrolysis gives a reducing sugar. The alga contains a chlorophyll like substance and a blue substance, algocyan, soluble in water and in glycerol with an intense red fluorescence, but no crystalline substance except a small amount of the magnesium salt of an organic acid. A new form of extraction apparatus suitable for continuous extraction of large quantities of material with volatile solvents and a modification of the Kjeldahl method of nitrogen determination enabling analyses to be made on as little material as 5 to 10 mgrms., are described.—T. C.

Ultra-violet radiation; Mode of action of—in producing sterilization. W. E. Burge, J. Franklin Inst., 1916, 182, 261—265.

FLUID cultures of liquefying bacilli were exposed to the action of ultra-violet rays until all the bacilli were killed. The dead bacilli were washed with salt solution, and ground with sand and dilute alcohol, 10 c.c. of the extract was added to a tube of gelatin medium, and 10 c.c. of a living culture was added to another tube of gelatin. Six species of bacilli were examined in this way, and in each case practically as much liquefaction of the gelatin was produced by the extract of the dead bacilli as by the living culture. This indicates that the sterilising action of ultra-violet rays is not due to the destruction of intracellular enzymes.—J. H. J.

Disinfecting power of disinfectants in relation to their concentration. J. P. Gregersen. Zentr. Bakt., 1915, I., 77, 168. Chem.-Zeit., 1916, 40, Rep., 259.

USING the garnet method of Krönig and Paul, the time required to kill a given kind of bacterium was determined, and the reciprocal of the value thus obtained was taken as a measure of the disinfecting power of the antiseptic in question, under the

given conditions of concentration, temperature, and kind of bacterium. By this method the disinfecting power of hydrochloric acid, mercuric chloride, iodine in potassium iodide, and formaldehyde, in aqueous solutions, was found to be directly proportional to the concentration, whilst that of phenol, thymol, and chloral hydrate was proportional to the fourth power of the concentration.

—A. S.

Solubility of calcium and magnesium soaps. Fahrion. See XII.

Chemical composition of Oscillaria prolifica. Turner. See XX.

PATENTS.

Water; Purification of—. F. and F. P. Candy, London. Eng. Pat. 10,705, July 23, 1915.

THE water is chlorinated in the usual manner and after standing for a half hour, is passed through a layer, about 18 ins. deep, of washed lignite, broken into granules $\frac{1}{2}$ — $\frac{1}{4}$ in. size. A suitable rate of flow is about 150 galls. per sq. ft. per hr., but the rate may be adjusted according to the depth of the lignite, and *vice versa*. The lignite is supported on a layer of sand, over a layer of graded gravel or pebbles, resting on a perforated floor. The lignite becomes inefficient after about a year's use, but may be revived by soaking in commercial hydrochloric acid for 12—24 hours.—J. H. J.

Filters; Feed water—. H. B. Watson and T. B. Billetop, Newcastle-on-Tyne. Eng. Pat. 10,940, July 28, 1915.

IN filters in which filter cartridges are used within an outer casing, the filtering area of the cartridges is increased without increasing the over-all dimensions by corrugating them longitudinally. The frames are also strengthened by inserting into them a strip of metal bent into a zig-zag form. The outer cylindrical casing is divided into compartments by partitions parallel to the axis.—W. H. C.

Feed water; Treatment of—for preventing corrosion and incrustation in steam generators and the like. H. Laraque, Sheffield. Eng. Pat. 100,830, May 9, 1916. (Appl. No. 6613 of 1916.)

A COMPOSITION of tannin, aluminium sulphate, and barytes, in proportions corresponding to the amount of impurities present, is added to the water.—W. H. C.

Water; Purification of—. H. Kriegsheim, Assignor to The Permutit Co., New York. U.S. Pat. 1,192,075, July 25, 1916. Date of appl., May 16, 1916.

THE water, with or without the addition of a salt of aluminium, is treated with a small proportion of sodium silicate and passed through a granular bed of a silicate with an exchangeable base.—J. H. J.

Sterilization of liquids by ultra-violet rays; Apparatus for—. M. von Recklinghausen, Paris, Assignor to The R.U.V. Co., New York. U.S. Pat. 1,190,609, July 11, 1916. Date of appl., Jan. 15, 1914.

THE apparatus consists of a concrete tank through which the liquid to be sterilised flows. A quartz container projects into the tank through an opening in the side, and is connected on the outside with a box containing an ultra-violet ray lamp and accessories. The lamp slides into the quartz container.—J. H. J.

Sewage sludge and like materials; Treatment of—. E. A. Paterson, Thorold, Ontario, Canada. Eng. Pat. 10,670, July 22, 1915.

THE sludge is fed under pressure through a flat nozzle on to a travelling perforated belt, which

passes through a drying chamber heated by gas burners or other means. The upper part of the drying chamber is divided into sections by baffle-plates extending from the roof to just above the sludge layer on the belt. In front of each baffle-plate is an outlet, with a damper, leading to the main outlet flue through which the steam and gases given off from the sludge are drawn by a fan. The roof of each section of the drying chamber is lower than that of the preceding one, in order that more heat may be reflected on to the sludge as it gets drier.—J. H. J.

Garbage, sludge, and other like substances; Apparatus for disposition of—. R. W. Amos, Hackensack, N.J., Assignor to National Purification Co. U.S. Pat. 1,188,382, June 27, 1916. Date of appl., Feb. 15, 1912.

THE garbage is heated in a retort and the vapours given off are led by a pipe to a condensing chamber forming the lower compartment of a separating box from which the condensed alcoholic liquid produced may be drawn off. The box is divided by a perforated plate into the condensing chamber and a filter chamber filled with a filtering medium for the lighter ammoniacal vapours; the pipe leading away the vapour from the filter chamber passes through and serves to heat a combined evaporating and crystallising apparatus.—J. H. J.

Destructor-furnace. J. Primrose, Assignor to The Destructor Co., New York. U.S. Pat. 1,190,458, July 11, 1916. Date of appl., Sept. 4, 1914.

THE furnace has a trough grate, with its side plates suspended along their upper edges from the walls of the furnace, and with a flat bottom supported on the side plates. The front of the grate is secured to the front wall of the furnace, and the back has a sliding support on the back wall. The grate has a central ridge on which an angle iron slides, for removing the clinker. Air is supplied above the grate through perforations in the top of the ridge.—J. H. J.

Disinfection; Process of—. Schweizerisches Serum u. Impfinstitut, Bern, Switzerland. Eng. Pat. 9637, July 1, 1915. Under Int. Conv., July 13, 1914.

A MIXTURE of 300 grms. each of dehydrated copper sulphate, finely powdered potassium chlorate, and pulverised iron is placed in a tub and covered with a litre of water and a litre of formalin. The heat of hydration of the copper sulphate is sufficient to decompose the potassium chlorate, and the additional heat thus produced vaporises the formalin. The iron combines with the liberated oxygen. Manganese dioxide may be added if desired.—J. H. J.

Formaldehyde gas; Method of generating—. H. Anhaltzer, Pittsburgh, Pa. U.S. Pat. 1,191,647, July 18, 1916. Date of appl., June 12, 1914.

A MIXTURE of equal parts of paraformaldehyde and potassium or sodium persulphate is treated with a solution of sodium peroxide.—J. H. J.

Insecticides; Waterproof—. International Color and Chemical Co., Assignees of A. S. Ramage, Detroit, Mich., U.S.A. Eng. Pat. 100,302, Mar. 13, 1916. (Appl. No. 3734 of 1916.) Under Int. Conv., Apr. 16, 1915.

A SPRAYING composition for foliage which when dry is practically waterproof is obtained, for example, by adding 10% by weight (calculated to dry arsenate) of a soluble (tallow) soap to a suspension of lead arsenate in water and then adding lead acetate or nitrate solution so as to obtain a precipitate of an insoluble lead soap distributed over the arsenate. Such a spraying composition possesses excellent adhering and

weathering qualities, has no corrosive effect upon the foliage, and requires only about one-half the usual number of sprayings to ensure protection. Spraying compositions containing Paris green may be prepared similarly, precipitating in this case a copper soap, the products being strongly water-repellent.—F. W. A.

Clarifying waste waters; Apparatus for —. R. Schilling, Schöneberg, Germany. U.S. Pat. 1,192,569, July 25, 1916. Date of appl., Mar. 5, 1912. SEE Eng. Pat. 2741 of 1912; this J., 1912, 699.

XX.—ORGANIC PRODUCTS; MEDICINAL SUBSTANCES; ESSENTIAL OILS.

Poison oak; The poisonous principle of —. J. B. McNair. J. Amer. Chem. Soc., 1916, 38, 1417—1421.

POISON oak (*Rhus diversiloba*) and poison ivy (*Rhus toxicodendron*) differ very slightly botanically and the poisonous constituents are very similar in pharmacological action, solubility, and other properties. On extracting chips of the limbs of the former plant with gasoline and subsequently removing the solvent, a black, poisonous residue was obtained which after hydrolysis with dilute sulphuric acid did not yield fisetin, gallic acid, or rhamnose, the substances obtained by Syme (this J., 1906, 951) by the hydrolysis of the black poisonous residue obtained by the ether extraction of the leaves and flowers of *Rhus toxicodendron*. Doubt is therefore thrown on the conclusion attributed to Syme that the poison of *Rhus toxicodendron* is a glucoside of fisetin, gallic acid, and rhamnose.—T. C.

Poison ivy; The poisonous principle of —. S. F. Acree. J. Amer. Chem. Soc., 1916, 38, 1421—1425. (See also preceding abstract.)

McNair's reasoning that the limbs of *Rhus diversiloba* (poison oak) might be expected to contain the same toxic constituent as the leaves of *Rhus toxicodendron* (poison ivy) is contrary to well-established evidence that the chemical constituents of different species may vary widely whilst the botanical differences may be only slight, and that the constituents of the leaves of a given species are generally not identical with those found in the limbs of the same plant. The poisonous tar obtained by Syme from *Rhus toxicodendron* was most probably a mixture of toxic and non-toxic constituents, and Syme took into account the fact that the gallic acid, fisetin, and rhamnose which he obtained from the hydrolysis of the poisonous tar might be derived from some constituent of the tar other than the toxic constituent itself.—T. C.

Euthamia Caroliniana; Volatile oil of —. G. A. Russell. J. Amer. Chem. Soc., 1916, 38, 1398—1402.

DISTILLATION of 83 kilos of *Euthamia Caroliniana* (L.) Greene, gathered in Florida, just previous to flowering, yielded 576 grms. of a pale yellow oil having a pleasant aromatic odour. After storing for 15 months the oil possessed the following constants: sp.gr. = 0.8587 at 23° C., n_D^{20} = 1.4805, n_D^{25} = 1.4748 at 23° C.; it consisted mainly of dipentene with a trace of pinene and possibly a small amount of limonene, together with about 10% of an unidentified *levo*-rotatory compound or compounds of high density. The oil contained 5.35% of free and 1.66% of combined alcohols, a small amount of aldehydes, but no free acids or phenols. It is readily soluble in 6 vols. and in excess of 90% alcohol and in 9 vols. of 70% alcohol with slight cloudiness.—T. C.

d-Pinene hydrochloride and hydrobromide. d-Camphene. D. E. Tsakalotos and B. Papaconstantinou. J. Pharm. Chim., 1916, 14, 97—103.

d-PINENE hydrochloride, prepared from *d*-pinene separated from Grecian oil of turpentine (see this J., 1915, 237), had $[\alpha]_D^{25}$ = +33.19°, m.pt. 127.1° C., b.pt. 207° C. at 750 mm., and a molecular weight of 172 (theory, 172.5). The dextro-rotatory power of the substance is thus established, although other observers have stated that it is inactive. The hydrobromide had $[\alpha]_D^{25}$ = +31.31°, m.pt. 80° C., and a molecular weight of 214.4 (theory, 217); it decomposed when boiled. *d*-Camphene was prepared by treating *d*-pinene hydrochloride with potassium phenoxide, distilling the product, and collecting the portion passing over between 145° and 170° C. This portion was washed with sodium hydroxide solution, and re-distilled. It had $[\alpha]_D^{25}$ = +84.05°, m.pt. 42.7° C., b.pt. 157.6° C. (745 mm.), and a molecular weight of 137.5 (theory, 136.1).—W. P. S.

Salvarsan and neo-salvarsan; Excretion and secretion of —. J. Webster. Analyst, 1916, 41, 231—237.

SALVARSAN and neo-salvarsan are excreted fairly rapidly at first, but the amount *per diem* falls after the second day, until at the end of a week the quantity excreted is comparatively small. Arsenic may, however, be found in the urine at the end of three weeks or even longer after the dose has been given. In cases following death after the injection of these substances, relatively large amounts of arsenic are found in the liver, kidneys, and spleen, and small amounts in the muscles and blood. Arsenic is entirely, or almost entirely, absent from the brain and nervous system. Beneficial results have been obtained from the ingestion by a syphilitic child of milk from the mother who had undergone treatment by salvarsan. In several cases the milk was examined and found to be free, or practically free, from arsenic; this fact points strongly to the presence of antibodies in the milk serum and not to the actual presence of salvarsan. The method of analysis used consisted in oxidising the organic matter with nitric and sulphuric acids, then reducing with potassium metabisulphite, and determining the arsenic in the "electrolytic Marsh" apparatus, using platinum electrodes.—W. P. S.

Vitamines; Chemical nature of the —. I. Antineuritic properties of the hydroxypyridines. R. R. Williams. J. Biol. Chem., 1916, 25, 437—446.

As indications are forthcoming that the natural "vitamines" are pyridine derivatives, the curative action of a number of synthetic substances of this type was tested on polyneuritic pigeons. Only in the case of α -hydroxy- and 2.4.6- and 2.3.4-trihydroxypyridines was any evidence of curative power obtained. The erratic nature of the results obtained with these three substances suggests that their physiological action may be influenced by keto-enol tautomerism, and attempts were made to study the individual action of the dynamic isomers. α -Hydroxypyridine was obtained in needles and as granular crystals, but neither form as tested by K. Meyer's bromine method was enolic. A solution in sodium hydroxide, however, rapidly absorbed bromine in excess of that required by the soda, and was probably 50—60% enol. Owing to the difficulty of definitely isolating the isomerides or determining the proportions present in a mixture, the biological results were not conclusive, but the granular crystalline form was certainly inactive, and aqueous solutions of the needle variety after some days lose their curative action. Caustic soda solutions were also active, but whether this is due to the enol form is un-

certain, since the keto form was also present in such solutions.—G. F. M.

Guanidine sulphate; Preparation of—P. A. Levene and J. K. Senior. *J. Biol. Chem.*, 1916, 25, 623—624.

GUANIDINE sulphate may be prepared by the hydrolysis of dicyanodiamide (100 grms.) with 75% sulphuric acid (200 c.c.). After the spontaneous evolution of gas has subsided, the mixture is heated for 5 mins. and allowed to cool. When the product begins to solidify, 1500 c.c. of 95% alcohol is added and the crystals of ammonium sulphate filtered off. The filtrate, after concentration to 300 c.c., is neutralised with barium carbonate, and the liquid, after filtration of the barium salts, and exact neutralisation with sulphuric acid, is further concentrated to a thick oil, which on pouring into 1000 c.c. of alcohol slowly solidifies to a crystalline mass of nearly pure guanidine sulphate (about 125 grms.).—G. F. M.

Vicine and divicine. P. A. Levene and J. K. Senior. *J. Biol. Chem.*, 1916, 25, 607—622.

THE position of the two amino-groups in divicine was ascertained by its oxidation, on the one hand, to guanidine, thereby demonstrating the presence of a 2-amino group, and by comparison of its transformation products with those of the 2,5- and of the 4,5-diamino bases. Its constitution is definitely established as 2,5-diamino-4,6-dioxypyrimidine. Vicine is shown to be a monomolecular nucleoside, containing one δ -glucose and one pyrimidine residue in the molecule, but the point of attachment is still undetermined.—G. F. M.

Cholesterol; Comparison of the results obtained by the colorimetric and gravimetric determinations of—J. H. Mueller. *J. Biol. Chem.*, 1916, 25, 549—560.

WHEN applied to solutions of pure cholesterol, Autenrieth and Funk's colorimetric method (*Munch. Med. Woch.*, 1913, 60, 1243) and the digitonin method of Windaus (*Z. physiol. Chem.*, 1910, 65, 110) give accurate results. The discrepancies which have been recorded between determinations of cholesterol in blood by these two methods are traced on the one hand to incomplete extraction of the dried blood, and recourse must be had to hot alcohol or alcohol and ether, as ether extraction alone, even when prolonged, is incomplete. On the other hand colorimetric analyses of blood give high results, as they represent cholesterol plus some closely-related substance or substances of the nature of oxidation products. For this reason the digitonin method is to be regarded as giving more nearly correct results.—G. F. M.

Acetone; Determination of—in presence of ethyl alcohol. J. Rakshit. *Analyst*, 1916, 41, 245—246.

A PORTION of the sample, containing about 0.05 gm. of acetone, is placed in a 750 c.c. flask, 300 c.c. of freshly-prepared lime-water is added, the flask is closed loosely with a rubber stopper, and its contents heated to 35° C.; 5 c.c. of N/5 iodine solution is then added, drop by drop, and after shaking for 5 mins., a second 5 c.c. is added, and so on until 40 c.c. in all has been introduced. After 10 mins., starch solution is added, the mixture cooled, acidified with 15 c.c. of N/1 sulphuric acid, and the excess of iodine titrated with N/10 thiosulphate solution. The number of c.c. of N/5 iodine solution used is multiplied by 0.00193 to obtain the quantity of acetone in the portion of the sample taken. If, during the addition of the iodine, the colour persists after thorough agitation, more lime-water should be added. About 0.8 c.c. of N/5 iodine is absorbed by

1 c.c. of ethyl alcohol. When the sample contains only about 1 part of acetone and 100 parts of ethyl alcohol, the results are not very trustworthy, but in samples containing 1 part of acetone and 10 parts of ethyl alcohol the results are accurate and concordant.—W. P. S.

Methyl alcohol; Decomposition of—by means of heated copper. C. Mannich and W. Geilmann. *Ber.*, 1916, 49, 585.

ON passing methyl alcohol over heated copper, formaldehyde and hydrogen are produced (Sabatier and Senderens, this J., 1903, 577). The yield of hydrogen is greater than would correspond to the amount of formaldehyde, due partly to the decomposition of the latter into carbon monoxide and hydrogen and partly to its condensation to give methyl formate.—F. W. A.

Formaldehyde; Contamination of—by copper. H. Kunz-Krause. *Apoth.-Zeit.*, 1916, 31, 66. *Chem.-Zeit.*, 1916, 40, Rep., 286.

WHEN a copper spiral is used in the preparation of formaldehyde, contamination with copper readily occurs, owing to formation of volatile copper formate from formic acid produced by oxidation of the aldehyde. Copper, if present, may be removed by means of pieces of bright iron, the aldehyde being first shaken with calcium carbonate and filtered if it has an acid reaction. The presence of copper in formaldehyde may be detected by adding a few drops of pyridine, when a greenish-blue coloration is produced.—A. S.

Citric acid by fermentation. Martin. See XVIII.

PATENTS.

Therapeutically active substances from Corpus Luteum; Method of manufacturing two—O. Imray, London. From Soc. of Chem. Industry, Basle, Switzerland. Eng. Pat. 10,877, July 27, 1915.

By successive extraction with various solvents of the *Corpora lutea* taken from freshly killed animals, an alcoholic solution of two therapeutically active substances is obtained which can be fairly easily separated and purified by reason of their different solubilities in water and ether. One substance is a lecithin-albumin, easily soluble in water or 40% alcohol and insoluble in ether. It is used as 0.1% aqueous solution and has the property of inducing menstruation. The other substance belongs to the lipid class, has a deep red brown colour, and is easily soluble in ether and difficultly soluble in alcohol. It is used in solution in olive oil and has the property of suppressing menstruation. The former, water-soluble, substance can also be obtained in a similar manner from young *Corpora lutea*. Both substances can be administered by subcutaneous injection and the former in tablet form also. Analyses and suggested empirical formulæ are given for both substances.—B. V. S.

Hog-cholera antitoxin; Process of filtering—with the aid of chemicals. Process for producing a sterile hog-cholera antitoxin. J. Reichel, Philadelphia, and H. Werner, Glen Olden, Assignors to H. K. Mulford Co., Philadelphia, Pa. U.S. Pats. (A) 1,192,559 and (B) 1,192,560, July 25, 1916. Dates of appl., (A) Dec. 15, 1915, and (B) Mar. 10, 1916.

(A) HOG-CHOLERA antitoxin (1 litre) is treated with sodium citrate (75 grms.) and calcium chloride (25 grms.). The precipitate formed carries down the insoluble inert impurities of the antitoxin, and thus assists filtration. (B) The hog-cholera antitoxin is freed from all solid particles and the accompanying organisms in a suitable centrifugal machine, and the clear liquor is filtered first

through a layer of moist infusorial earth and then through a Berkefeld candle.—B. V. S.

Calcium acetylsalicylate; Manufacture of—. J. A. Wülfing, Berlin. Eng. Pat. 100,343, Jan. 18, 1916. (Appl. No. 827 of 1916.) Under Int. Conv., Apr. 29, 1915.

EQUIVALENT proportions of acetylsalicylic acid and calcium hydroxide are mixed intimately in the dry state, the mixture is moistened with a small amount of an aliphatic alcohol, ester, or ketone, and the mass is triturated until completely soluble in water; the solvent is removed, and the calcium acetylsalicylate dried, disintegrated, and extracted with small amounts of ether until neutral. Commercial methylethylketone, ethyl alcohol, and ethyl acetate have been found to be suitable solvents.—F. W. A.

Organic synthesis; Process for—. [Preparation of tartaric acid.] L. H. Baekeland, Yonkers, N.Y., and A. H. Peter, New York. U.S. Pat. 1,190,845, July 11, 1916. Date of appl., July 10, 1912.

A CHLORIDE solution is electrolysed so as to produce chlorine and an amalgam, and the chlorine is mixed with steam and led over carbon at about 300° C. to produce hydrochloric acid and carbon monoxide and dioxide. The hydrochloric acid and the amalgam are used in later stages of the process. The mixture of carbon monoxide and dioxide may be passed over carbon heated to redness to reduce the dioxide to monoxide, and the latter then converted into formate by passing it over alkali hydroxide at 180°–220° C.; or formate may be produced by saturating water with the carbon dioxide and reducing the latter by means of an amalgam in presence of acid. The formate is heated to 360°–440° C. under pressure to convert it into oxalate, the oxalate is reduced to glyoxalate by amalgam in presence of acid, and the glyoxalate is reduced electrolytically in alkaline solution in the cathode chamber of a cell containing a soluble chloride in the anode chamber, whereby racemic and mesotartarates are formed and precipitated. After separating the tartarates, the residual chloride solution may be evaporated, yielding steam for use in the process. The process thus forms a cycle of reactions by which carbon is caused to combine with the oxygen and hydrogen of decomposed water, with formation of tartaric acid as final product.—A. S.

Chlorinating; Process and apparatus for—. B. T. Brooks, H. Essex, and D. F. Smith. Assignors to Gulf Refining Co., Pittsburgh, Pa. U.S. Pat. 1,191,916, July 18, 1916. Date of appl., Dec. 8, 1915.

GASOLINE fractions or other organic liquids are chlorinated by placing them in an opaque container, the upper end of which is illuminated by a source of actinic light, and passing chlorine into the lower end of the container, the liquid being moved progressively from the bottom of the container into the illuminated region by a stirrer.—F. W. A.

4-Hydroxypiperidine; Preparation of N- and C-homologues of—. B. Emmert, Würzburg. Ger. Pat. 292,871, Mar. 5, 1915. Addition to Ger. Pat. 202,456 (this J., 1916, 868).

By reducing the N- or C-homologues of 4-hydroxypyridine (γ -pyridone) as described in the chief patent, the corresponding homologues of 4-hydroxypiperidine are produced.—A. S.

Phenylpropionic acid compounds containing arsenic. E. Fischer, Berlin. Assignor to Synthetic Patents Co., New York. U.S. Pat. 1,181,580, July 18, 1916. Date of appl., Nov. 2, 1915.

SEE Eng. Pat. 295 of 1915; this J., 1915, 1072.

4,4'-Di[hydr]oxy-3,3'-diaminoarsenobenzene; Mixtures of alkali salts of— and process of making same. B. Reuter and K. Streitwolf, Assignors to Farb. vorm. Meister, Lucius, u. Brünig, Höchst, Germany. U.S. Pat. 1,191,997, July 25, 1916. Date of appl., Dec. 29, 1914.

SEE Eng. Pat. 24,152 of 1914; this J., 1915, 1165.

Ball mills [for grinding bacteria and bacterial products]. Eng. Pat. 100,719. See I.

Preparation of phthaleins and their halogen derivatives containing selenium. Ger. Pat. 291,883. See IV.

XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Pyrogallol and amidol; Production of— in Australia. Board of Trade J., Aug. 31, 1916.

As a result of extensive experiments, the Government Laboratory attached to the State Railway Department in Victoria is now producing pyrogallol and amidol in commercial quantities at a cost less than half the present market rates.

Red prussiate for blue print paper. U.S. Dept. Agric., Bureau of Chem. Bull. Paper-making, 1916, 253–254.

POTASSIUM ferricyanide is one of the principal components of the coating used for sensitising paper for photographic blue print reproductions. It is prepared by the oxidation of potassium ferrocyanide by chlorine gas, but at the present time the pure crystallised red prussiate is extremely scarce. Experiments at the Bureau of Chemistry have shown that it is not necessary to employ the pure salt, but that the crude oxidised solution, containing a small amount of potassium chloride, gives perfectly satisfactory blue print papers, provided the liquid be used soon after it is prepared. A convenient charge, yielding 1 lb. of red prussiate in solution, is prepared by dissolving 1½ lb. of potassium ferrocyanide in 2½ quarts of water. After the oxidation is complete, the excess of chlorine must be removed, preferably by forcing or aspirating a current of air through the liquid until no odour remains.—J. F. B.

PATENTS.

Blemished moving-picture films; Process for restoring—. F. W. Hochstetter, New York, Assignor to P. M. Pierson, Scarborough-on-the-Hudson, N.Y. U.S. Pat. 1,192,424, July 25, 1916. Date of appl., June 20, 1913.

THE film is coated with an oily substance which softens the emulsion surface, and the oil is then removed by a rubbing and buffing process which cleans the film and closes up scratches in its surface.—B. V. S.

Colour photography. P. D. Brewster, East Orange, N.J. U.S. Pat. 1,191,941, July 25, 1916. Date of appl., Feb. 11, 1913.

SEE Fr. Pat. 468,297 of 1914; this J., 1914, 986.

XXII.—EXPLOSIVES; MATCHES.

Sodium, potassium, and ammonium nitrates, potassium chlorate, and mercury fulminate; Hygroscopic properties of—. G. B. Taylor and W. C. Cope. U.S. Bureau of Mines. Met. and Chem. Eng., 1916, 15, 140–143.

As the result of experiments made in connection with the study of detonators (blasting caps), the

hygroscopic properties of mixtures of mercury fulminate and potassium chlorate were found to be almost entirely due to the latter constituent. With commercial detonators the absorption of moisture was constant for detonators of the same diameter and independent of the chlorate content and weight of the charge. Fulminate-chlorate detonator composition does not absorb atmospheric moisture at all until the air is almost saturated, i.e., about 97% between 0° and 35° C. The hygroscopic properties of the salts investigated were found to be a function of the humidity of the air and the vapour pressures of the corresponding saturated solutions, the latter values being capable of calculation when the moisture absorptions of the salts are known. The maintenance of constant conditions of humidity is the most important factor in determining the relative moisture absorptions of salts, for which purpose exposure on watch-glasses over water in ordinary desiccators is wholly unsatisfactory.—W. E. F. F.

PATENTS.

Match-splints; Composition for imparting flaming and non-glowing properties to —. Treated match-splints and process of producing same. W. G. Wey, Oswego, N.Y., Assignor to The Diamond Match Co., Chicago, Ill. U.S. Pats. 1,191,544 and 1,191,545, July 18, 1916. Dates of appl., Nov. 7, 1912, and Sept. 22, 1915.

THE splints are impregnated for a considerable part of their length with molten paraffin wax containing a solution of an inorganic phosphorus compound in an oil which is miscible with paraffin wax. The wax acts as a flame carrier and the phosphorus compound prevents glowing when the flame is extinguished.—W. E. F. F.

XXIII.—ANALYSIS.

Calorimeter; An adiabatic —. F. Daniels. J. Amer. Chem. Soc., 1916, 38, 1473—1480.

AN adiabatic calorimeter is described, which obviates the necessity of the cooling correction. The inner can, containing the thermometer and the source of heat, is filled with water, and is set on glass supports in a slightly larger vessel, and the whole is closed tightly by means of a ground-in brass cover. This arrangement is supported on glass rods in a large double-walled copper vessel which is filled with water and provided with a stirrer. Immersed in the water of the inner calorimeter and this outer water jacket are the junctions of a thermocouple so that temperature differences of 0.01° C. can be immediately detected by means of a mirror galvanometer. In use the radiation or conduction from the calorimeter proper is prevented by maintaining the outer water jacket at precisely the same temperature by hand manipulation of an electric heating circuit the terminals of which are connected with the inner wall of the outer vessel and the outer wall of the inner vessel respectively, so that the current actually traverses the water jacket, and the lag attendant on the use of resistance spirals is obviated. An automatic control by means of a selenium cell and a relay is also described which for a slow rise of temperature in the calorimeter will keep the determination adiabatic to within 0.02—0.03° C. without attention.—G. F. M.

Indicator for acidimetry and alkalimetry, and for the determination of hydrogen ion concentrations between the limits of 6 and 8 on the Sørensen scale; New and sensitive —. M. T. Hoger and G. Scatchard. J. Amer. Chem. Soc., 1916, 38, 1606—1615.

A DINITROBENZYLENEUREA is described, the

monosodium salt of which forms a very sensitive indicator, changing from colourless to greenish-yellow between $pH=6$ and 8. It is easily prepared by converting anthranilic acid into its uramino-acid by the action of potassium cyanate, condensing the product to benzoyleneurea by means of sodium hydroxide, and nitrating. It resembles *p*-nitrophenol more closely than any other well-known indicator. It is affected only slightly by neutral salts, and not at all by chloroform or toluene. Proteins (egg-albumin) have no more influence on it than on *p*-nitrophenol. Its colour fades only slightly in a week, and is not changed by nitrous acid. It can be used in cold or boiling solutions, and gives a sharp end-point with ammonia and hydrochloric acid, but cannot be used to titrate carbonates. It should prove superior to rosolic acid for the preparation of neutral ammonium citrate solutions for soil analyses.—J. H. L.

Ferric oxide; Use of — as standard in the volumetric estimation of iron in hydrochloric acid solution. I. Brandt. Chem.-Zeit., 1916, 40, 605—607, 630—633.

Ferric oxide is obtained in a state of great purity as follows: iron, free from cobalt and practically free from phosphorus, is dissolved in not too great an excess of hydrochloric acid, and the solution is diluted to a maximum strength of 10 grms. of iron per litre, heated to boiling, and then treated with hydrogen sulphide until cold. After filtering, the liquid is concentrated by evaporating in large porcelain dishes and again filtered. The ferrous chloride solution is oxidised with nitric acid of sp. gr. 1.4 (45 c.c. to 100 grms. iron), evaporated to dryness, twice evaporated to dryness with hydrochloric acid, the residue dissolved in dilute hydrochloric acid, and treated with 200 c.c. of concentrated acid. When quite cold, this solution is extracted with ether in a separating funnel of 1 litre capacity (i.e., for 100 grms. iron), care being taken to cool with running water at first. After being well shaken the aqueous liquid is run off from the green ethereal solution, and when the extraction has been repeated a second and, if necessary, a third time, the ether extracts, filtered through a dry paper, are united and the solvent distilled off. The residual ferric chloride solution is then heated in a covered spouted beaker or in a covered dish, until the pleasant-smelling fumes have been (practically) expelled; the syrupy residue, which crystallises on cooling and which contains both ferric and ferrous salt, is dissolved in dilute hydrochloric acid, filtered, diluted, and then reduced with sulphur dioxide. The reduction can be hastened by adding about 2 grms. of iodine, and in this case heat need not be applied. The excess of acid is removed with ammonia, or better with ammonium carbonate, the liquid is diluted to about 3 litres with hot distilled water, and the iron precipitated as ferrous oxalate with ammonium oxalate. The precipitate is washed repeatedly with hot water, first by decantation, then on the filter, dried, and powdered in an agate mortar; it is decomposed by heating it in a silica dish, gently at first and then more strongly, until a constant weight is obtained. During the ignition, the mass is stirred constantly with a quartz rod or with a thick silver wire. If a platinum vessel be used, traces of that metal are found in the oxide; a large porcelain crucible, however, can be employed. Larger quantities of iron, e.g., 200 grms., can be converted with equal facility. If commercial ferric oxide or chloride be used instead of the metal, the extraction with ether is performed on the initial solution in hydrochloric acid, followed by reduction and treatment with hydrogen sulphide; in this case the filtrate from the hydrogen sulphide precipitate can be precipitated with ammonium oxalate forthwith, but the hydrogen sulphide must be

completely removed previously, preferably by boiling in a current of carbon dioxide. Made in this way, ferric oxide dissolves readily in hydrochloric acid; it is very pure and even if some phosphorus be present in the metal used, at the most only $\frac{1}{100}$ of it is found in the finished product; volumetric determinations with permanganate gave results in complete accord with those obtained by the author's previous method of preparing the oxide through the nitrate, and by comparison with iron wire of which the iron content was found gravimetrically. The Verein Deutscher Chemiker has recommended the adoption of pure iron oxide, obtained as above, for use in preparing volumetric standards.—E. H. T.

Gold; Iodometric determination of — L. Vanino and F. Hartwagner. *Z. anal. Chem.*, 1916, 55, 377—388.

A MODIFICATION of Peterson's method (this J., 1899, 176) is described, the gold chloride ($\text{AuCl}_3 \cdot \text{HCl}$) being treated with a mixture of potassium iodide and iodate and the liberated iodine then titrated with thiosulphate solution. The reactions proceed according to the equations:— $6(\text{AuCl}_3 \cdot \text{HCl}) + 18\text{KI} = 6\text{AuI} + 12\text{I} + 18\text{KCl} + 6\text{HCl}$; $6\text{HCl} + 5\text{KI} + \text{KIO}_3 = 6\text{I} + 6\text{KCl} + 3\text{H}_2\text{O}$; and $18\text{I} + 18\text{Na}_2\text{S}_2\text{O}_3 = 18\text{NaI} + 9\text{Na}_2\text{S}_4\text{O}_6$. Three molecules of thiosulphate correspond, therefore, with 1 atom of gold (see also Gooch and Morley, this J., 1900, 72). Provided that the salt contains no free acid, the method yields fairly accurate results; with quantities of gold of 2 to 10 mgrms., the error varies from -0.9 to +4.5%. The method may also be applied to the salt $\text{AuCl}_3 \cdot 2\text{H}_2\text{O}$; the quantity of iodine liberated from potassium iodide by this salt is a measure of the gold content; the difference between this quantity of iodine and that liberated when a mixture of iodide and iodate is added gives the amount, if any, of hydrochloric acid present.—W. P. S.

Vanadium; Separation of — from phosphoric and arsenic acids, and from uranium. W. A. Turner. *Amer. J. Sci.*, 1916, 42, 109—110.

VANADIUM can be separated quantitatively from phosphoric and arsenic acids by means of the "cupferron" method (this J., 1916, 558), but in these cases the precipitates must be washed very thoroughly. Di-sodium hydrogen phosphate, or the corresponding arsenate, was mixed with a weighed quantity of standardised ammonium vanadate solution, and a 6% solution of cupferron used as precipitant.

When ammonium vanadate and uranyl nitrate solutions are mixed, yellow uranyl vanadate is precipitated; hence the separation of vanadium and uranium had to be performed in presence of acid (10 c.c. of sulphuric acid per 100 c.c. of solution), and the precipitate was washed with sulphuric acid containing 1.5 grms. of cupferron per litre. A more complete separation was effected by replacing the washed precipitate, with the filter, in the original beaker, dissolving the vanadium precipitate in ammonia, nearly neutralising with acid, and cooling to 20° C. After dilution and acidification, the vanadium was re-precipitated by adding a little more cupferron. The uranium in the filtrate was determined by precipitation with ammonia in presence of ammonium chloride. In this way it was found that the whole of the uranium used was recovered, but the vanadium found was nearly 3% greater than the quantity taken.

—E. H. T.

Tellurium and arsenic, and iron, thallium, zirconium, and titanium; Qualitative separation and detection of — P. E. Browning, G. S. Simpson, and L. E. Porter. *Amer. J. Sci.*, 1916, 42, 106—108.

THE solution containing tellurium and arsenic in

presence of dilute hydrochloric acid, is treated with sodium sulphite and potassium iodide to precipitate the tellurium (Noyes and Bray, *J. Amer. Chem. Soc.*, 1907, 29, 137). The filtrate is boiled to remove sulphur dioxide, treated with hydrogen peroxide to decompose the iodide, and then boiled to remove iodine. Thereupon the liquid is made alkaline with caustic soda, and more peroxide added to convert the arsenic into arsenate. After acidifying, the arsenate is precipitated by addition of ammonia and magnesium chloride mixture. The filtrate from the arsenic precipitate may be tested for molybdenum by treatment with potassium thiocyanate and zinc in hydrochloric acid solution.

To separate iron, thallium, zirconium, and titanium, the precipitated hydroxides are dissolved in a minimum amount of sulphuric acid, and hydrogen peroxide is added; a red coloration indicates titanium. After rendering slightly alkaline with caustic soda, adding sodium phosphate, and then acidifying with sulphuric acid containing hydrogen peroxide (to keep the titanium oxidised), zirconium is precipitated as phosphate ($\text{ZrO}(\text{HPO}_4)$). The filtrate from this precipitate is then treated with caustic soda, whereby iron and thallium are removed, and the liquid is again filtered. The filtrate is acidified with sulphuric acid, and the titanium then precipitated as phosphate ($\text{TiO}(\text{HPO}_4)$) by adding sodium sulphite and a little more sodium phosphate. The mixed iron and thallium hydroxides or phosphates are dissolved in sulphuric acid, sodium sulphite is added, followed by potassium iodide, which precipitates thallous iodide; the filtrate from the latter is boiled to remove sulphur dioxide, treated with hydrogen peroxide to remove iodine and to oxidise the iron, and the latter is then identified with potassium thiocyanate.

—E. H. T.

Valuation and efficiency of gas oils. Downing. See IIA.

Differentiation of natural asphalts from industrial pitches. Hutin. See IIA.

Determination of the permeability to heat of textile fabrics. Bauer. See V.

Test for grease-proof properties of imitation parchment and "pergamyn" papers. Bartsch. See V.

Precipitation of magnesium salts by ammonium carbonate. Fichter and Osterwalder. See VII.

Determination of small quantities of sulphide sulphur. Drushel and Elston. See VII.

Determination of glycerol in hardened fats. Nor-mann and Hugol. See XII.

Iron-gall inks. Gravimetric determination of gallic and tannic acids. Kempf. See XIII.

Approximate determination of colophony in the gum-resins used in the rubber industry. Hutin. See XIV.

Determination of very small quantities of water in alcohol by means of the critical solution temperature. Rodt. See XVIII.

Determination of fat in cacao products. Lange. See XIX.

Modification of the so-called Mohler's reaction for benzoic acid [in foods]. Grossfeld. See XIX.

Comparison of results obtained by colorimetric and gravimetric determinations of cholesterol. Mueller. See XX.

Determination of acetone in presence of ethyl alcohol. Rakshit. See XX.

Trade Report.

Prohibited imports. Board of Trade J., Aug. 31, 1916.

THE following further rulings and decisions have been arrived at by the Department of Import Restrictions:—

Not prohibited: Cement for leather belting; chalk; synthetic rubies (from South Africa).

Prohibited: Artificial leather (made of cotton); compounds of brandy; compounds of rum; fruit pectin.

Prohibited imports. Royal Proclamation, Aug. 18, 1916.

THE importation of chestnut extract and of glass (window, plate, sheet, and table ware) into the United Kingdom is prohibited as from and after Aug. 21, 1916.

Notification of accidents and poisoning under the Factory and Workshop Acts, 1901 to 1916. Home Office Notice, August, 1916.

ON and after the 4th September, 1916, it will no longer be necessary for the occupier to notify any accident to the certifying surgeon (s. 8 of the Police, Factories, etc. (Miscellaneous Provisions) Act, 1916). Accidents must, however, be notified as before, on Form 43, to the District Inspector of Factories and entered in the General Register. The certifying surgeon may be required by the inspector to investigate and report upon certain accidents, and for this purpose will have the same powers as in the past. The paragraph of the abstract as to "Notice to Certifying Surgeons" is therefore obsolete, and will be omitted in the next revision. The Accident Notice (Form 43) has been revised accordingly, and the amended form will be placed on sale at once.

Notice of every case of lead, phosphorus, arsenical, or mercurial poisoning, or anthrax, occurring in a factory or workshop, must still be sent to the certifying surgeon as well as to the inspector, and this requirement now applies also to cases of toxic jaundice, that is, jaundice due to tetrachlorethane or nitro- or amido-derivatives of benzene or other poisonous substance.

German contraband of war. Board of Trade J., Aug. 24, 1916.

AN Ordinance, dated 22nd July, declares the following absolute contraband: Powder and explosives of all kinds, smoke-producing and illuminating articles, incendiary matter, implements for fighting with gas, and materials which can be used for their manufacture, including:—Nitric acid and nitrates of all kinds; ammonia, ammonia liquor, ammonium chloride, ammonium salts; sulphur, sulphur dioxide, sulphuric acid, fuming sulphuric acid (oleum), carbon bisulphide; acetic acid, acetates; acetic ether, formic ether, sulphuric ether; acetone; ethyl and methyl alcohol (spirit), for example, sulphite spirit; urea; resinous products, camphor and turpentine (oil and spirit); calcium carbide; cyanamide; sodium cyanide; phosphorus and its compounds; chlorates and perchlorates of sodium, barium, and calcium; chlorine, chlorhydrin; bromine; phosgene (carbonyl chloride); stannic chloride; mercury; pitch; tar, including wood-tar, wood-tar oil; benzol, toluol, xylol, solvent naphtha, phenol (carbolic acid), cresol, naphthalene, and their mixtures and derivatives; aniline and its derivatives; glycerin; manganese dioxide; arsenic and its compounds. Photographic articles. Coal and coke. Flax, hemp, jute, vegetable fibres and yarns made therefrom. Wool, raw, combings or cardings; wool waste, flocks of wool and wool combings; carded and combed woollen yarn; animal hair of all kinds, as well as flocks, combings and yarns made of animal hair. Raw cotton,

linters, cotton waste, cotton yarns, cotton goods and other cotton products capable of being used in the manufacture of explosives. Gold, silver, coined and in bars, paper money, and all negotiable commercial documents and marketable securities. Rubber tyres for motor vehicles, as well as all articles and materials used specially in manufacturing or repairing rubber tyres. Rubber (including crude rubber, waste rubber, reclaimed rubber, rubber solution, rubber cement, or any other preparation containing rubber), balata and guttapereha, as well as the following kinds of rubber—viz., Borneo, Guayule, Jelutong, Palembang, and all other materials containing rubber; besides articles which are made in whole or in part of rubber. Mineral oils (including shale oils, petroleum, benzine, naphtha, gasoline). Lubricants. Tanning material of all kinds, including quebracho wood and the extracts used in tanning. The following ores—Tungsten ores (wolframite and scheelite), molybdenite, manganese ore, nickel ore, chrome ore, zinc ore, lead ore, hematite iron ore, pyrites (crude and calcined), copper ores. Aluminium, aluminium salts, calcined alumina, bauxite. Antimony, together with the sulphides and oxides of antimony. Felspar. The following metals—Tungsten, molybdenum, vanadium, nickel, selenium, cobalt, hematite pig iron, manganese and its alloys, copper and its alloys, tin, lead. Alloys of iron (ferro compounds), including tungsten, manganese, vanadium, and chrome iron.

The following, coming under the designation of conditional contraband, shall be considered as contraband of war: Foodstuffs. Forage and all kinds of feeding stuffs for animals; oil seeds, nuts, and kernels; animal, fish, and vegetable oils and fats, excluding those suitable as lubricants, and not including volatile oils. Fuel, exclusive of coals, coke and mineral oils. Cement.

The following cannot be declared contraband of war:—Raw silk. Resin, shellac, hops. Horns, bones and ivory. Natural and artificial fertilisers. Earths, lime, chalk, stones including marble, bricks, slates, and roofing tiles. Porcelain and glass. Paper and the materials prepared for its manufacture. Soap, colours, including the materials exclusively used for their manufacture, and varnish. Chloride of lime, soda, caustic soda, sulphate of soda in cakes, copper sulphate.

Books Received.

COAL MINE FATALITIES IN THE UNITED STATES, 1915. Compiled by A. H. FAY. LIST OF PERMISSIBLE EXPLOSIVES, LAMPS, AND MOTORS TESTED PRIOR TO JAN. 1, 1916. U.S. Bureau of Mines. 80 pages. Price 10 cents.*

INFLAMMABILITY OF ILLINOIS COAL DUSTS. By J. K. CLEMENT and L. A. SCHOLL, JUN. U.S. Bureau of Mines. Bull. 102. 74 pages. Price 15 cents.*

INSTRUMENTS FOR RECORDING CARBON DIOXIDE IN FLUE GASES. By J. F. BARKLEY and S. H. FLAGG. U.S. Bureau of Mines. Bull. 91. 60 pages. Price 10 cents.*

ANALYSIS OF NATURAL GAS AND ILLUMINATING GAS BY FRACTIONAL DISTILLATION AT LOW TEMPERATURES AND PRESSURES. By G. A. BURRELL, F. M. SEIBERT, and I. W. ROBERTSON. U.S. Bureau of Mines. Techn. Paper No. 104, 1915. 41 pages, 9 x 6 in. Price 5 cents.*

A DESCRIPTION OF the analysis of gaseous mixtures by liquefaction by means of liquid air, followed

by fractional distillation in a vacuum (see this J. 1914, 808; 1915, 17, 267, 411, 540, 895).

PREPARATION OF PURE IRON AND IRON-CARBON ALLOYS. By J. R. CAIN, E. SCHRAMM, and H. E. CLEAVES. U.S. Bureau of Standards. Scientific Paper No. 266. 25 pages. Price 10 cents.*

See this J., 1916, 470.

STANDARD TEST-SPECIMENS OF ZINC-BRONZE (Cu 88, Sn 10, Zn 2). PART I. PREPARATION OF SPECIFICATIONS. By C. P. KARR. **PART II. MICROSTRUCTURE.** By H. S. RAWDON. U.S. Bureau of Standards. Technologic Paper No. 59. 67 pages. Price 25 cents.*

See this J., 1914, 1012; 1915, 1057, 1255.

RULES AND REGULATIONS FOR METAL MINES. By W. R. INGALLS, J. DOUGLAS, J. R. FINLAY, J. P. CHANNING, and J. H. HAMMOND. U.S. Bureau of Mines, Bull. 75. 296 pages, 9×6 in. Price 35 cents.*

In 1906 a Committee was appointed by the American Mining Congress to draft a law governing quarrying and metalliferous mining which could be recommended to the several States for adoption, in the hope that it would tend to lower the number of accidents occurring in mines. This Bulletin contains a draft and synopsis of the proposed law, a digest of State metal mine inspection laws, chapters on mining inspection systems, and data regarding fatal and non-fatal mine accidents.

REPORT OF THE SELBY SMELTER COMMISSION. By J. A. HOLMES, E. C. FRANKLIN, and R. A. GOULD. U.S. Bureau of Mines, Bulletin 98. 528 pages, 9×6 in. Price \$1.25.

The Commission was appointed, as a result of litigation between the Selby Smelting and Lead Co. and the citizens of Solano County, California, to consider whether the company was violating the terms of a Court injunction. This Bulletin contains the report of the Commission and also papers on the effect of smelter smoke on vegetation and on animal life. The Bulletin is illustrated by 55 plates and diagrams.

MANUFACTURE AND USES OF ALLOY STEELS. By H. D. HIBBARD. U.S. Bureau of Mines, Bull. 100. 77 pages, 9×6 in. Price 10 cents.*

A brief description is given of the various alloy steels and their uses, with a bibliography of the literature relating to each.

PROHIBITIONS OF EXPORT IN FORCE IN THE UNITED KINGDOM AND IN CERTAIN ALLIED AND NEUTRAL COUNTRIES. Supplement to the "Board of Trade Journal," Aug. 17, 1916, containing complete lists of articles which according to the latest information received by the Board of Trade, are prohibited to be exported from the United Kingdom and certain foreign countries, viz.: Denmark, France (and Algeria), Greece, Italy, Japan, Netherlands, Norway, Portugal, Roumania, Russia, Spain, Sweden, and Switzerland. Price 3d.

ANNUAL REPORT ON THE MINERAL PRODUCTION OF CANADA IN 1914. By J. McLEISH. Canada Dept. of Mines, Report No. 384. 362 pages, 9½×6½ in. (See this J., 1915, 363.)*

INVESTIGATION OF A REPORTED DISCOVERY OF PHOSPHATE IN ALBERTA. By H. S. DE SCHMID. Canada Dept. of Mines, Bull. No. 12. 38 pages, 9½×6½ in.*

SAMPLES OF phosphate from belts in the Banff District, Alberta, contained on the average 20% P₂O₅, the highest being 27.63%. Two of the

outcrops are conveniently situated for transportation purposes. The mineral is not suitable for treatment by the sulphuric acid process, but one of the "thermic" processes might be utilised for its conversion into superphosphate.

REPORT OF THE COMMITTEE OF THE PRIVY COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH FOR THE YEAR 1915-16. [Cd. 8336.] Wyman & Sons, Fetter Lane, E.C. 50 pages. Price 3d.

DESCRIPTION OF THE LABORATORIES OF THE MINES BRANCH OF THE DEPARTMENT OF MINES, OTTAWA. Canada Dept. of Mines, Bulletin No. 13. 51 pages and 60 plates, 9½×6½ in.*

PETROLEUM AND NATURAL GAS RESOURCES OF CANADA. VOL. II. DESCRIPTION OF OCCURRENCES. By F. G. CLAPP and others. Canada Dept. of Mines, Mines Branch, Rept. No. 291. 404 pages, 9½×6½ in.*

CONTAINS detailed descriptions of the Canadian oil and gas fields, illustrated by 71 photographs and drawings and six maps. Statistics of the production of petroleum and natural gas are appended (see this J., 1916, 200).

UNITED STATES MINING STATUTES ANNOTATED. By J. W. THOMPSON. U.S. Bureau of Mines, Bulletin 94 (Law Serial 4). 1772 pages, 9½×5½ in. Part I. Sections and Statutes relating to metalliferous and coal mining. Part II. Miscellaneous mining subjects. Price \$2.50.

ABSTRACTS OF CURRENT DECISIONS ON MINES AND MINING. October, 1914, to April, 1915. By J. W. THOMPSON. U.S. Bureau of Mines, Bulletin 101 (Law Serial 5). 138 pages, 9½×5½ in. Price 15 cents.

TWENTY-SIXTH ANNUAL REPORT OF THE KENTUCKY AGRICULTURAL EXPERIMENT STATION, FOR THE YEAR 1913. State University Press, Lexington, Ky. 624 pages, 9×6 in.

In addition to the Report on the year's work of the Station, this volume contains Bulletins Nos. 169 to 177 of the Experiment Station, including reports on the woody plants of Kentucky, concentrated commercial feeding stuffs, the sulphur content of typical Kentucky soils, commercial fertilisers, and mineral waters.

A BIBLIOGRAPHY OF THE CHEMISTRY OF GAS MANUFACTURE. By W. F. RITTMAN and M. C. WHITAKER. U.S. Bureau of Mines, Tech. Paper 120. 29 pages, 9×6 in. Price 5 cents.*

GASOLINE MINE LOCOMOTIVES IN RELATION TO SAFETY AND HEALTH. By O. P. HOOD and R. H. KUDLICH. With a chapter on methods of analysing exhaust gases, by G. A. BURRELL. U.S. Dept. of Mines, Bull. 74. 83 pages, 9×6 in. Price 15 cents.*

SHOT-FIRING IN COAL MINES BY ELECTRICITY CONTROLLED FROM OUTSIDE. By H. H. CLARK, N.Y. BERTH, and C. M. MEANS. U.S. Bureau of Mines, Tech. Paper 108. 36 pages. Price 5 cents.*

MINE VENTILATION STOPPINGS, WITH ESPECIAL REFERENCE TO COAL MINES IN ILLINOIS. By R. Y. WILLIAMS. U.S. Bureau of Mines, Bull. 99. 30 pages, 9×6 in. Price 10 cents.*

* A certain number of these publications can be obtained free on application to the respective Government Departments. In the case of the U.S. Government publications, when this supply is exhausted, copies can be obtained at the prices mentioned from the Superintendent of Documents, D.C., U.S.A.

